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The Economic Record

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THE AUSTRALIAN ECONOMY—1965*

1. *Economic Development Since 1921*

The mainsprings of Australia's economic growth are: first, increase in the work force, and, secondly, the willingness to save and technical ability which are the necessary ingredients of technical progress. We shall begin, therefore, by briefly reviewing past trends in the movement of the work force and in its productivity.[1] The census of 1921 is a convenient starting point.

As the work force has grown, roughly 11 per cent of the increase has been absorbed into transport and communication, 17 per cent into finance, property and commerce, while 23 per cent has gone to the "services sector" providing education, health, government, entertainment, sport and domestic service.[2] What happened to the remaining 49 per cent of the increase in the work force? An outstanding feature of the employment scene has been the stagnation, indeed decline, in employment in primary industry (except for a temporary rise during the depression). It is rural industry which dominates here, and various factors have combined to limit the expansion of rural employment: higher factory wages and urban amenities have caused a drift to the cities, while developing agricultural mechanization has enabled the farmer to reduce his demand for both permanent and casual labour.[3] Rural employment which was around 550,000 in 1921 has declined to a relatively stable 500,000 persons. Hence the remainder of the growing work force has had to be employed, if at all, in manufacturing and construction. (As discussed below, this will be possible if the demand for the products of such naturally protected industries as construction grows at a rate greater than total production.)

Although statistics on the productivity of the work force are sketchy, certain basic facts seem clear enough. In the rural sector—Australia's traditional export industries—productivity has increased

* As a change from the usual survey of current economic conditions, we publish this projection, based on input-output data, of the structure of the Australian economy, particularly its prospects for internal and external balance, in 1965.—EDITOR.

1. For data on households' propensity to save, refer H. W. Arndt and B. Cameron, *Economic Record*, 1957, p. 108.

2. These approximate percentages are sufficiently close for our purpose. Refer 1947 and 1954 Census reports; also *Census Silhouette* issued by the Commonwealth Statistician, September 1956.

3. Limits to extensive development of the rural economy are set by a poor river system and by an uncertain rainfall which in the central two-thirds of the continent is under 20 in. and in much of the tropic north is concentrated in a summer period too brief for crop growth. The temperate slopes region (less than 10 per cent of the continent) contains half the sheep and, along with the Mallee, 90 per cent of the entire area sown to grains and fodder.

at a rate which has allowed farm output to increase proportionately to the increase in population.[4] As an indication of what has been happening elsewhere in the economy, consider manufacturing industry where the available statistics suggest that productivity rose at a compound rate of little more than 1 per cent per annum during the inter-war period and by almost 3 per cent per annum after the second world war.[5]

The situation we have been describing may be illustrated with some hypothetical figures. Let us suppose that population and work force increase by 1·5 per cent per annum and that productivity of the work force increases by a further 1·5 per cent per annum. If full employment is maintained real incomes will increase by around 3 per cent per annum. Knowing the habits of the population, it is fairly certain that demand for manufactured goods of a type which is to a large extent imported will also rise at this rate. Not to put too fine a point on it, if full employment is maintained imports will tend to increase by 3 per cent per annum. But rural production is rising only at the same rate as population, so that it is to be expected that rural exports will only grow at around the rate of 1·5 per cent per annum. So long as the economy relies on the rural sector for exports there is a steadily growing imbalance in the balance of payments, which of course may be resolved by rising terms of trade.

The above argument may be summarized as follows:

The physical limits to extensive development of Australian rural industry have limited the opportunities for raising rural employment, output and exports. The character of intensive development in the industry has also failed to provide rural employment, and at the same time the rate of growth of rural output and exports has failed to match the growth of G.N.P. and imports. We are concerned with the implications of these developments for the two policy objectives of full employment and balance of payments equilibrium. With a growing population which saves a significant part of its income, the task of maintaining full employment depends upon an adequate rate of investment activity. In the circumstances envisaged—in which exports grow proportionately to population, but imports grow proportionately to production—the maintenance of full employment will require that investment or government expenditure increases at a greater rate than production.[6] If the necessary rate is achieved there will be full employment and a progressive balance of payments deficit—while if it is not

4. Refer *Production* bulletin, Primary Industries Part I, 1955-6, p. 114. The quantum of farm production per head of population (a) shows marked annual fluctuations and (b) was relatively high during the depression decade. However, since 1920-1 the trend has been roughly constant at 92.

5. Refer R. Wilson, *Facts and Fancies of Productivity*, Economic Society, 1947, p. 45; S. P. Stevens, *Economic Record*, May 1954; A.N.Z. Bank *Quarterly Survey*, index of factory production.

6. This is true, even if the marginal on-site labour coefficient in rural industry is zero, because the marginal off-site labour coefficient in this industry is positive (of the order of 20 per cent measured in a common value unit). There is also the quite separate point that, *cet. par.*, the lower the rate of export growth the lower is farm investment and so the greater is the magnitude of the task of maintaining full employment.

achieved there will be unemployment. If we assume that full employment will be achieved by adequate investment expenditure then—at unchanged exchange rate and terms of trade—the nature of Australia's development appears to generate a balance of payments problem.[7] Any such progressive disequilibrium will be masked if the terms of trade improve—Australia's terms of trade for the ten years 1947-8 to 1956-7 averaged 25 per cent above the average for the three years ended June 1939.[8]

We have, of course, radically oversimplified the picture of Australian development. Changes in exchange rates and tariff protection have in practice altered relative prices and so the average propensity to import. Exports of non-ferrous metals have been significant. We have ignored development overseas, not least differential rates of inflation. Moreover, it may be that at a certain stage of development of an immature economy compared with the growth of already mature economies, external economies come thick and fast—and this would affect import propensities through relative prices. None the less, past trends do suggest the existence of an underlying structural problem in Australia's growth. The problem could be avoided by an uninterrupted rise in the terms of trade, by a higher rate of agricultural productivity or by a rate of productivity increase in manufacturing greater than in other countries. Regrettably, none of these alternatives can be relied upon.

2. *Post-war Growth of Production, Exports and Home Demand*

We shall now extrapolate post-war trends in order to assess the size of the employment and balance of payments problems inherent in the present rate of Australian development.

We will suppose that Australia experiences no war or serious economic recession between now and 1965, although a temporary setback in, say, 1962 need not seriously affect the argument. But we *are* supposing that the growth of unemployment can and will be prevented by political action—and in respect of 1964-5 are concerned to specify what that may involve. We must also suppose that the harvest (not least the wool clip) in 1964-5 is not reduced by drought below the long-run average yield. The results of assumptions set out in the notes to Table I regarding population, work force and national production are listed in that table.

The next of our extrapolations is concerned with export prospects. The quantities of some of our rural exports show fairly clear trends while for others—such as butter, wheat—the trend is not obvious. The results appear in Table II. Whereas farm exports in 1953-4 were £655 million, the value of the farm exports for 1964-5 in Table II is £900 million at 1953-4 prices.

The value of this quantum of exports in 1964-5 is an insoluble

7. The problem is worsened if we recognize a high marginal propensity to import investment equipment.

8. Refer *The Australian Balance of Payments*, No. 3, and subsequent annual issues by the Commonwealth Statistician.

TABLE I

	1 Population '000 mid-year (Dec.)	2 Employment '000 mid-year (Dec.)	3 Gross National Product at 1953-4 prices £m.
1920-1	5,411	—	—
1946-7	7,518	3,062	3,487
1953-4	8,903	3,579	4,557
1956-7	9,533	3,773	5,209
1964-5	11,344*	4,775†	7,296†

* June 1965.
† Assuming work force is fully employed.

Notes

1. Population estimate for June 1965 based on average of 1952-4 age-specific fertility rates until June 1960, thereafter diminishing uniformly to 1939 rates in the period 1970-5. Immigration at rate of 100,000 persons per annum.
2. Work force estimate for 1964-5 based on past censal experience of proportion of each quinquennial population age-group in work force.
3. G.N.P. deflation for 1946-7 and 1956-7 follows unpublished estimates by R. Gilbert. 1964-5 G.N.P. is obtained from extrapolated productivity changes for each of 119 industries, using 1953-4 employment weights. Aggregative extrapolations of G.N.P. against employment suggest a 1964-5 G.N.P. of up to 4 per cent higher than this estimate. Refer also Section 3 below.

TABLE II

Australian Farm Exports

Commodity	Unit	Quantity Exported 1953-4	Quantity Exported 1956-7	Estimated Exports 1964-5
Wheat	m. bus.	38·504	91·107	103·000
Barley	m. bus.	28·216	26·501	42·000
Oats	m. bus.	2·385	8·165	4·000
Flour	m. sh. ton	0·603	0·750	0·691
Beef and Veal . ..	m. ton carcass	0·154774	0·149396	0·178
Mutton and Lamb . ..	m. ton carcass	0·044505	0·034051	0·038
Tinned Meat .	'000 ton	65·333	50·086	67·000
Butter	'000 ton	40·913	76·265	75·000
Cheese	'000 ton	22·830	17·528	14·000
Processed Milk	'000 ton	50·600	59·300	66·000
Sugar ..	m. ton	0·707445	0·675282	0·940
Fruit	m. ton	6·596	4·582	8·000
Preserved Fruit	m. lb.	199·219	134·002	264·000
Dried Vine Fruit . ..	m. lb.	139·822	100·837	170·000
Greasy Wool .	m. lb.	990·000	1,217·000	1,380·000
Scoured Wool.	m. lb.	76·100	90·100	80·000
Sheep Skins .	mil.	16·130	15·593	19·150
Cattle Skins ..	'000 lb.	21,070	47,052	75,000

enigma and we can do no more than array some facts and choose a benchmark. During the three years ending June 1954, the Commonwealth Statistician's export price index[9]—in which wool, wheat, butter, meats, sugar and dried fruits have a total weight of 91 per cent

9. Excluding gold. Three years ended June 1939 = 100.

—was virtually constant at 496. From 1953-4 to 1957-8 it fell from 496 to 400. Over the four years 1954-5 to 1957-8, the *average* index was 432. By September 1958 the index had dropped to 339. Since we are measuring all other values (including imports) at 1953-4 prices, the figure we choose for the export price index for 1964-5 will imply the terms of trade, and it is therefore relevant to point out that the Commonwealth Bank's import price index (1952-3 = 100) rose from 98 in 1953-4 to 107 in 1957-8. In summary, the average experience for 1954-5 to 1957-8 provides some basis for the assumption that 1964-5 export prices will be 20 per cent lower, relatively to the rest of the price structure, than in 1953-4. In round terms, this means that the terms of trade (three years ended June 1939 = 100), which fell from 127 in 1953-4 to 94 in 1957-8, are assumed to recover to 102 (the 1956 level) in 1964-5. Although the terms of trade might be worse, it would be unwise to assume they will be better than this—especially when we have made no allowance for the average incidence of poor harvests. Hence farm exports in 1964-5 are assumed to be £720 million.[10]

The foregoing assumptions also affect the income of farmers which would, in the first instance, be raised from £526 million in 1953-4 by £245 million (= 900-655) to £771 million and reduced by the relative price fall to £591 million. If we suppose that one-third of this increase of £65 million is redistributed to the rest of the community, the net result is that income of farmers is £569 million. We will henceforth suppose the 1964-5 full employment G.N.P. figure of £7,296 million to be reduced by the relative fall in export prices to £7,116 million.[11]

Non-farm exports (including all receipts for goods and services exported) cannot be so readily extrapolated. We will assume a growth rate of 5 per cent per annum in real terms with no change in their terms of trade. Comparative rates of growth already assumed are 4.3 per cent per annum for real G.N.P. and 3 per cent per annum for real farm exports. Hence we assume that non-farm exports grow from £246 million in 1953-4 to £421 million in 1964-5.[12]

It is useful at this point to try to formulate some overall picture by drawing up estimates of the components of aggregate demand and supply.

An estimate of personal consumption for 1964-5 can be made as follows on the basis of past relationships:

	£m.
Gross national product is	7,116
Let personal income be 79 per cent of this	5,622
If income of farmers is	569
Then non-farm income is	5,053
Personal non-farm income tax at 8·2 per cent is	414
Non-farm disposable income is	4,639
Consumption at 98 per cent of N.F.D.I. is[13]	4,546

10. i.e. 80 per cent of £900 million.
11. The difference of £180 million is 20 per cent of £900 million.
12. In 1953-4 exports and other receipts for goods and services were £901 million, of which £655 million were farm exports.
13. A slightly lower estimate is obtained from the regression line $C = 160 \cdot 8 + 0 \cdot 9341$ (N.F.D.I.) discussed in *Economic Record*, April 1957, p. 115. This lower estimate, if used, would leave room for minimum frictional unemployment.

Private investment in fixed capital equipment together with public works averaged about 25·5 per cent of G.N.P. during the years 1953-4 to 1957-8. If that relation continues, capital investment for 1964-5 will be £1,815 million. Government expenditure on goods and services (excluding works) was 9·9 per cent of G.N.P. in 1957-8. If it is 10 per cent in 1964-5, we have an estimate of £712 million. These and other minor assumptions can be summarized:

Full Employment, 1964-5, at 1953-4 Prices (except for exports)

	£m.
Consumption	4,546
Exports	1,141
Investment (including public works)	1,815
Government (excluding works)	712
Financial	70
Non-farm stocks	75
Total demand	8,359
Gross national product	7,116
Imports	1,245
Total market supplies	8,361

In 1953-4 imports and other payments for goods and services were 18·3 per cent of G.N.P. Trends in the relative growth rates of imports and home production for a number of commodities (such as tobacco leaf, chemicals) suggest that we can properly choose a rather lower figure as a benchmark and 17.5 per cent of G.N.P. has been assumed here.

It is a little embarrassing to have produced a state of negligible unplanned stock change. Some other characteristics of the expected 1964-5 situation merit comment. First, the balance of payments deficit could easily be covered if capital inflow continues at its recent rate; if capital inflow is inadequate, the solution presumably lies in reducing imports—which implies that trade is going to be less important to Australia.[14] Second, the estimated consumer demand for 1964-5 is massive, and in terms of many individual commodities one is inclined to wonder whether such expenditure levels will be achieved.[15] However, the ratio of forecast consumption to 1964-5 G.N.P. is not quite

14. Starting from full employment, elimination of the balance of payments deficit requires that Australians reduce their real spending. Assuming exports cannot be increased, imports must be cut. This does not necessarily mean that import-competing industries will be stimulated. If imports were reduced by exchange depreciation (and tax rates raised to prevent inflation), some part of those commodities having a high price elasticity of demand would be subtracted from the Australian consumer's bill of fare. In reality there is likely to be some structural dislocation involving stimulus to import-competing (and export) industries at the expense of industries producing non-traded goods.

15. The answer to this doubt is probably that most per capita consumption-income demand schedules for individual commodities are S-shaped. In Australia we usually have very little idea as to where we lie on the S.

up to the high level of 1957-8.[16] Finally, the maintenance of full employment depends on the continuance of investment at the high level we have assumed. It is well to remember that this rate of investment could suffer a sharp setback if the rate of population growth were to fall seriously (a fall which would not, however, be matched by a fall in the work force seeking employment in 1964-5).

In the next section we shall examine the implications of the foregoing assumptions for the individual sectors of the economy.

3. *The Changing Industrial Structure*[17]

So far we have only tried to foresee the global problems facing the Australian economy. But even if every forecast in section 2 were correct, what would it all mean to businessmen in individual industries?

To try to answer this we have assembled four kinds of information. First, using a classification of Australian industry into 119 sectors we have compiled an array of technical input coefficients representing the technology of these industries in 1953-4. This array has been modified wherever more recent data are available, e.g. on new processes brought into operation since 1953-4. Although many of the coefficients will doubtless vary, our study of time series[18] suggests that it is not basically misleading to suppose that input coefficients will be substantially the same in 1964-5. Second, however, the previous comments do not apply to labour input coefficients which are regarded as the main medium through which the impact of technical change is felt. Consequently an extrapolation has been made of the expected labour input coefficient in 1964-5 for each of the 119 industries.[19] (From this extrapolation of recorded series was derived the 1964-5 G.N.P. used in section 2.)

Third, studies have been made of the movement of the ratio of imports to home production of the commodities produced by the 119 industries. In conformity with section 2, we assume that the import-

16. If the forecast £104 million overseas deficit were eliminated by exchange control and if inflation were prevented by taxes reducing consumption, estimated consumption in 1964-5 would still be a slightly higher proportion of G.N.P. than in 1953-4.

17. This section gives an interim report on work done by Margaret Charlesworth, D. P. Evans, Laura Hodan and Jill Pertoldi. We are indebted to private and public organizations for their generous assistance. Thanks are especially due to the Department of Trade and to the Commonwealth Bureau of Census and Statistics.

18. Refer B. Cameron, "The Production Function in Leontief Models", *Review of Economic Studies*, Vol. XX (1), p. 62. This study has been extended and brought up to date in an appendix to our 1957 mimeographed Research Report.

19. It was assumed that aggregate rural employment is constant at slightly less than 0·5 m. persons. The rise in labour productivity (1953-4 to 1964-5) was estimated for the rural sector at 28 per cent. In manufacturing, estimates of productivity increase varied from around 5 per cent for several foodstuffs to 57 per cent for power generation and higher increases in some engineering activities—the weighted average increase for factories being approximately 19 per cent. Estimates of productivity increase in the services sector (even more tentative than elsewhere) varied from 6 per cent for railways to 20 per cent for commerce and 40 per cent for shipping. The weighted average of these estimated productivity increases for all industries was 20 per cent or 1·67 per cent per annum.

output ratios will be around the 1957-8 level (which in total is 17·5 per cent of G.N.P.).[20]

Fourth, we have compiled a set of estimates of final demand for each of the commodities produced by our 119 industries. Some comment is worth while on the method of doing this.[21] Effort was largely concentrated on estimating personal consumption. The approach was historical and formal statistical methods were not used. However, it was a basic assumption of the inquiry that real non-farm disposable income is a major determinant of demand. Table III gives some of the estimates.

TABLE III

Personal Consumption

Selected items*		1953-4	1964-5 estimated
Bread	m. 2-lb. loaf	771·966	1,105·0
Beef	m. ton (carcass)	0·4552	0·7298
Mutton and Lamb	m. ton (carcass)	0·3151	0·3849
Milk	m. gal.	245·0	370·0
Butter	'000 ton	113·384	145·826
Confectionery	m. lb.	137·805	197·249
Beer	m. gal.	205·178	326·06
Tobacco	m. lb.	46·06	76·005
Furniture	£m. 1953-4	50·755	91·5
Newspapers, Books, etc. .	£m. 1953-4	59·75	96·42
Footwear	m. pr.	22·454	32·773
Knitted Goods	£m. 1953-4	52·72	84·72
Cotton Fabrics	m. sq. yd.	125·816	202·182
Clothing	£m. 1953-4	154·62	227·54
Electricity	m. kwh.	3,943·0	10,039·0
Coal Gas	m. cu. ft.	27,737·0	38,945·0
Petrol	m. gal.	269·805	508·252
Refrigerators	m.	0·282	0·471
Electrical Goods	£m. 1953-4	59·48	99·41
Motor Vehicle Repairs ..	£m. 1953-4	59·684	115·97
Pottery, Glassware . ..	£m. 1953-4	52·739	88·15
Pharmaceuticals	£m. 1953-4	50·39	93·99
Road Passenger Transport	£m. 1953-4	55·128	88·59
Rail Passenger Transport	£m. 1953-4	32·328	41·19

* These items (selected from the complete list of 193) are each estimated at more than 1 per cent of expected consumer expenditure in 1964-5. Where the unit is £, the valuation is at 1953-4 purchaser's value to permit comparison with consumption statistics in the national income white paper. (Actual calculations were at producer's value.) Coal gas and rail transport do not reach the 1 per cent level but are included for comparison.

In the estimation of investment demand, motor vehicles are of special interest. The number of motor vehicles purchased per £ of real G.N.P. rose steadily from 1946-7 to a peak in 1950-1. This latter figure has since been roughly maintained save for deviations caused

20. However, the ratio for tobacco leaf was reduced markedly because of the firm downward trend.

21. All calculations involving the 119 × 119 inverse were in physical units or *producer's* values. All estimates of the final bill of goods were done both on this basis and at purchaser's values to ensure overall equivalence of the present input-output approach with the aggregate method in Section 2.

by recession and sales tax. At the same time total motor vehicle registrations per capita have continued to rise strongly right up to the present. Our assumption that the new motor vehicle/G.N.P. ratio in 1964-5 will be the same as in 1950-1 implies that total vehicle registrations per capita will continue to rise. The effect of the assumption is that demand for new motor vehicles is estimated to rise from 183,000 units in 1953-4 (228,000 in 1957-8) to 325,000 units in 1964-5. As regards other investment goods, it was assumed that investment demand for rolling stock, ships, ovens, commercial refrigerators and agricultural machinery would not do much better than keep pace with population growth. Demand for electrical products, other engineering equipment and for building and construction was assumed to match approximately the rise in G.N.P. As with all other categories of final demand, the aggregate of these investment demands equals that used in section 2 (£1,815 million).

In estimating export demand, extrapolation was employed in respect of rural products, non-ferrous metals and mineral oils. Export demand for other commodities was assumed to have a growth rate of rather less than 4 per cent to give an aggregate export demand of £1,141 million in 1964-5. With regard to government demand (excluding public works), its composition was assumed to change in a similar fashion to personal consumption over the period 1953-4 to 1964-5.

In principle, the assembled estimates of 1964-5 aggregate final demand for each commodity, taken together with the array of input coefficients and import ratios, should allow us to compute estimates of the total Australian output required from each industry in 1964-5.[22] Unfortunately, persistent computing difficulties have been associated with the relatively detailed 119 sector analysis and these difficulties have not yet been completely resolved. In the meantime, all the data have been aggregated on to a 40 sector basis and this has made possible

22. The operation is based on the equilibrium condition

$$FD_i - k_i = -\Sigma a_{ij} X_j + (1 + m_i) X_i$$

where FD_i is final demand for commodity i, k_i is a constant initially having zero value, a_{ij} is the technical input coefficient showing the amount of i required per unit of output of j, m_i is the import-output ratio for commodity i and X_i is the output of i.

The actual procedure is as follows:

The matrix of coefficients on R.H.S. is inverted on a high-speed computer. The output of each industry is obtained by applying the bill of goods to the inverse (refer *Economic Record*, 1958, p. 362). Usually the resulting set of outputs does not represent full employment equilibrium—as we would find by applying the labour input coefficients to the industry outputs and comparing the aggregate of the results with the work force. In that case the bill of goods has to be raised or cut to give a demand for labour equal to the labour available. (Refer also Evans, Cornfield and Hoffenberg, "Full Employment Patterns 1950", *U.S. Monthly Labor Review*, 1947.)

In the event of a balance of payments deficit, exchange controls or tariffs may be used to move the import-output schedule vertically downward say by 100 units so that now the constant $k_i = -100$, i.e. $-k_i = 100$, showing the inflationary effect on the home economy of a switch from imports to home production. In order to stop this inflationary effect income taxes may be raised and in the simplest (though improbable) case the final demand (FD_i) for i might fall by just 100 units. In that case the L.H.S. of the above equation is unchanged and our original multiplication of the inverse by the bill of goods remains relevant. In real life, of course, we will meet the distasteful (from a computing view) fact that the tariff raises demand for the products of industry i, but income tax reduces demand for industry j.

a speedy computation of the forecast increases in Australian output shown in Table IV.

TABLE IV

	Industry	Estimated 1964-5 Output 1953-4 = 100
1.	Sheep	133
2.	Other rural	160
3.	Beer, tobacco	164
4.	Foodstuffs	140
5.	Wood-working	169
6.	Paper, printing	154
7.	Chemicals, rubber, miscellaneous manufactures	161
8.	Textiles, clothing, leather, footwear	148
9.	Black coal	172
10.	Brown coal	233
11.	Other mining and refining	121
12.	Non-ferrous rolling and extrusion	156
13.	Non-ferrous founding and casting	149
14.	Oil refining	820
15.	Coke	157
16.	Electricity	197
17.	Gas	163
18.	Briquettes	446
19.	Iron and steel	180
20.	Radio and electrical	163
21.	Motor vehicles: assembly	189
22.	parts	187
23.	repairs	189
24.	Ferrous castings	187
25.	Rolling stock	136
26.	Ships and boats	134
27.	Tractors, agricultural machines	138
28.	Sheet-metal products	156
29.	Pipes	160
30.	Wire	133
31.	Stoves and ovens	166
32.	Refrigerators	164
33.	Engineering	160
34.	Building, etc.	171
35.	Rail transport	151
36.	Road transport	161
37.	Airways	160
38.	Shipping, coastal	126
39.	Commerce	157
40.	Other services	135

The results in Table IV should be read in the light of the conclusion in section 2 that the forecast situation is one of full employment and balance of payments deficit. The forecast rate of growth for individual industries could be altered by exchange control to eliminate the deficit (if capital inflow is inadequate) and by income taxes to prevent inflation. In general the table shows what one would expect in relative rates of growth. In particular we may note an abnormally high rate for oil refining because refineries have come onstream since 1953-4, a high rate of growth for electricity and a scarcely smaller rate for motor vehicle industries. The table does not give reliable results for solid fuel because the use of an old input-output table fails to take account of substitution away from coal which has resulted from the increased availability of fuel oil since 1953-4.

4. *Conclusion*

Since forecasts are almost always wrong, they can perhaps only be justified by the belief that intelligent planning is the product of past errors. Reflecting on the formidable array of assumptions in this paper, I should agree that population increase may be rather lower, productivity increase rather higher. Such modifications would not substantially affect the forecast of full employment in 1964-5 with real gross national product about 60 per cent higher than in 1953-4, although it may well be that the balance of payments deficit will be worse than predicted.

Forecasting the growth of individual industries is a much more hazardous undertaking than extrapolating the trend of total national production. The most obvious way of forecasting the growth of a single industry is to estimate the trend line of output. This trend line estimation is possible nowadays for almost every industry because of the wealth of output information published by the Commonwealth Statistician and in the A.N.Z. Bank's index of factory production. However, forecasting by trend line is subject to the criticism that it makes no pretence at analysing the influences affecting the growth of output, but merely assumes that these (unspecified) influences will change in the future in the same way as in the past. The input-output approach does make such a pretence. It argues that changes in the output of an industry result from three influences: changes in household and other final demand, changes in technology and changes in propensity to import. What makes the input-output approach hazardous is the difficulty of getting information on changes in these influences. For example the calculations leading to Table IV ignore changes in technology. This has the result, noted above, that forecast black coal output is much too high. But, of course, there will be changes in technology apart from substitution between fuels, and so there will be more errors in the forecast. A comparable comment may be made regarding changes in the influence of final demand on output. Here, of course, we have attempted to allow for changes in the composition of final demand, but the attempt can hardly be regarded as satisfactory. There seems to be a great deal of truth in the argument that as national income per head rises, demand per head for any commodity rises slowly at first, then rises more rapidly as growing income allows demand to "spill" on to this commodity, then less rapidly as satiety is approached. But if this argument is valid, the information available for translating it into numerical quantities is at present vague and inexact.

To sum up, errors in Table IV are due neither to mistakes by the electronic computer nor (as I believe) to mistakes by economic theorists. They are due to our failure to anticipate satisfactorily the changing nature of final demand, technology and importing habits. The reader can hardly be blamed if he prefers to rely on trend line estimation until we have better basic data on these three influences affecting the growth of output.

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THE ATTEMPTED NATIONALIZATION OF BANKS IN AUSTRALIA, 1947

The abortive attempt to nationalize the commercial banks of Australia in 1947 was motivated by many of the same factors which had brought about the nationalization of the large commercial banks of France in the previous year. A long-standing distrust of banks and bankers, a lively memory of the depression years of the 1930's, and a firm determination to avoid postwar unemployment by government action at almost any cost, operated in both countries to create a political demand for changes in the banking laws.

In Australia the various socialist and labor parties had long advocated the control or even the abolition of banking for private profit. As early as 1890, the Socialist League in Sydney, New South Wales, had included in its platform the establishment of a government bank which would absorb all privately-owned banks and eliminate the profit motive from the banking business. This theme kept recurring in socialist and labor publications and was given further impetus by the panic of 1893 and the banking failures which accompanied it.

The definitive account of events in Australia in their period is yet to be written, but some facts seem fairly clear. There had been a tremendous real estate boom in the previous decade, with land in some areas increasing in value ten-fold in as many years. Much of the financing of the boom was made possible by the inflow of British funds. Mortgage and finance companies were organized to invest these funds, and paid higher rates of interest on deposits than did the banks. But new banks were organized also, and made loans against the wool clip which was steadily rising in price.

Eventually the boom collapsed; wool prices fell and with them the price of land. The Argentine collapse and the Baring crisis stopped the inflow of London funds. Forty mortgage and finance companies failed between July 1891 and April 1892. This increased the pressure on the already weakened banks and fifteen of the total twenty-six had to close by 1893. Twelve of them were able to reopen after a few months by obtaining additional capital through the issue of preference shares or indeterminate deposit certificates. A large part of the £69 million of deposits of the suspended banks was eventually repaid, although it took thirty years in some cases. The net loss was nevertheless heavy; it was estimated by the Royal Commission of 1936 as about £21 million, an enormous sum at a time when the population of Australia was still less than two million.[1]

The events of that period left a deep impress on the public mind, and confirmed the worst suspicions of the socialists and the Labor Party. Every Australian debate on banking since that time has

1. A. L. G. Mackay, *The Australian Banking and Credit System* (King, London, 1931). McConnell, *The Origin and Development of the Commonwealth Bank* (Institute of Public Affairs, N.S.W., 1945).

referred to it. The banks are sometimes blamed for the crash because they over-extended themselves, but more often they are taken to task for "the extinction of millions off [*sic*] the medium of exchange, resulting from unduly restricting the function of supplying credits".[2] However, no State government even under a Labor administration passed any legislation affecting banks operating within its territory. In 1895 the State of Victoria had a Commission on a State Bank but nothing came of it.

When the Commonwealth Government was established in 1901, the left-wing parties began to think in terms of a national bank. But it was not until 1908 that the Labor Party, now operating on a nationwide basis, included as part of its "fighting platform" of immediate objectives, a plank calling for the establishment of a "Commonwealth Bank of Issue, Deposit, Exchange and Reserve, for the purpose of carrying out with facility and economy the financial transactions of the Commonwealth and State Governments" but at the same time "absolutely free from political control". No mention was made of the privately-owned trading banks.[3]

This original plan as drawn up by the redoubtable King O'Malley would have given the central government half of the capital stock, the rest to the States. The bank would have acted as fiscal agent for all of them, and would have been empowered to grant them temporary loans. It would have had the monopoly of the note issue, as well as the coinage. The bank would have carried on a regular banking business with the public, but it would also have held the reserve deposits of the trading banks operating in the Commonwealth. The Treasurer would have attended all meetings of the Board of Management, without a vote, and the actual management would have been in the hands of a comptroller and a representative from each state. O'Malley saw that a central bank in the modern sense, limited to rediscounting and open market operations, would have little to do in Australia where there was as yet no money market; it was for that reason that he included ordinary banking with central banking functions. But he hoped that the bank would nevertheless provide "general regulation of the movement of the credit and money volume", and at the same time keep interest rates low.[4]

No such legislation was possible until the Labor Party gained control of both houses in 1910. For a time the new Prime Minister, Andrew Fisher, seemed little interested in a banking bill, and contented himself with the passage of the Australian Notes Act which took all note issue out of the hands of the trading banks and put it into the hands of the Treasury. O'Malley used his position as Cabinet Minister to organize what he called a "Torpedo Brigade" to push a banking bill. After fifteen months of pressure the Labor Caucus agreed, and the Prime Minister introduced a bill to create the Commonwealth Bank.

2. King O'Malley, *Big Battle* (pamphlet published by the author, 1939).
3. McConnell, *op. cit., passim.*
4. L. C. Jauncey, *Australia's Government Bank* (Cranley & Day, London, 1933), p. 49. McConnell, *op. cit.*, p. 8.

It did not follow the O'Malley plan entirely, but was set up as a trading bank with special privileges and obligations towards the government; curiously, no capital was provided for it.

The bill was debated for about eight weeks, and was passed practically without amendment on December 22, 1911. The savings bank section of the law was the first to be put into operation. The branches of the various State Savings Banks which had formerly been served by post offices were taken over by the Commonwealth Bank, and with this advantage, its business soon overshadowed that of the older savings banks. The trading section of the Bank did not go into operation until January 1913, and it grew more slowly. The other banks were cooperative in their attitude and the Bank of New South Wales even permitted the Commonwealth Bank to use its branches as agencies for a time. Clearing house facilities were made available to it without the usual gold deposit. The lack of a paid-in capital was somewhat obviated by a large deposit from Tasmania, whose Treasurer was persuaded to place with it the savings bank funds from his state. The first Governor of the Bank was a former inspector of the Bank of New South Wales, the oldest of the trading banks. As might have been expected, he did not make the Commonwealth Bank an aggressive rival of his former associates.[5]

During its first decade, which was also the period of the first world war, the Commonwealth Bank did little to justify the hopes which had been placed in it by its Labor sponsors. It did not provide large additional amounts of credit at low rates for the primary producers who are the group most dependent upon the banks in Australia. Nor did it function as an effective central bank. The Conservative Government in 1924 took a step in the direction of central banking by putting the bank under the control of a board and giving it the monopoly of the note issue. The Labor opposition claimed that the members of the governing board were all "anti-labour and big business" and it is true that they were mostly representatives of finance, industry and commerce. In 1928 this board took another step in the direction of true central banking, by agreeing that it would abandon active competition with the trading banks, but this was not embodied in any legislation. The trading banks in this period were making use of balances at the Commonwealth Bank for clearing purposes, but did not treat them as reserves.[6]

In the meantime, the postwar inflation was producing difficulties. The State Governments by the late 1920's found themselves in serious financial straits and they were unable to borrow any more. The Commonwealth Government was obliged to step in and consolidate their debts and the Australian Loan Council under the Financial Agreement Validation Act of 1929, was given the power to regulate all future borrowing.[7] As the crisis worsened and unemployment increased, the

5. McConnell, *op. cit.*, p. 9. O'Malley, *op. cit.*, p. 18.
6. Hansard, 17 Parl., 3rd Sess., 1st Period, p. 2493, June 1, 1945. Arndt, *The Australian Trading Banks* (Cheshire, Melbourne, 1957), p. 155.
7. Giblin, *The Growth of a Central Bank* (M.U.P., Melbourne, 1951), p. 52 ff.

Loan Council insisted that state governments should make an effort to balance their budgets rather than to increase expenditures. This pre-Keynesian policy engendered great bitterness, much of which was turned against the banks.

One result of this animosity was the effort of the Scullin Labor administration in 1930 to provide more government control for the trading banks. A bill was brought in to turn the Commonwealth Bank into a modern central bank with rediscounting of commercial paper and management of the foreign exchanges as its principal activities. This bill was passed in the House of Representatives, but in the Senate, where the Government faced a hostile majority, it received an adverse report from the Select Committee appointed to consider it, and finally lapsed. The witnesses before the Committee showed little interest in the major features of the bill; Labor spokesmen were fearful of political control, and banking interests objected to the provisions for unsecured loans to Commonwealth and State Governments.[8]

As the depression grew worse, prices fell, business required fewer loans, and bank advances declined. The change was blamed upon the bankers' refusal to make loans, and upon the deflationary policy of the Federal Government. The resentment was intensified when in May 1931 the State Savings Bank of New South Wales was obliged to close its doors. It had been one of the largest of the Australian savings banks, and had loaned heavily to finance homes and primary producers. It was still solvent, but not liquid, when it appealed for help to the Commonwealth Bank. That bank announced that it could do nothing until it had examined the books of the Savings Bank—a statement that confirmed the worst fears of the depositors and started the run which forced the bank to close. The official Labor interpretation of these events was that the courageous action of the Savings Bank in fighting the deflationary policy of the Commonwealth Bank caused it to be "smashed".[9]

The catastrophic events of the depression years again brought to the fore the problem of banking control. Although the nationalization of banking in Australia had long been included in the general platform of the Labor Party, it had never been one of its immediate objectives. After 1930 and 1931, however, the subject began to be discussed openly in Parliament. Senator Kneebone, speaking in the Senate early in 1931 on the Central Reserve Bank Bill (which was not passed) said he trusted that "this is a step towards the nationalization of banking. . . . Credit should, generally speaking, be 100 per cent nationally controlled." And James Scullin, Leader of the Labor Opposition in Parliament, made several public statements during 1932-33 in favour of nationalization of all banking.[10]

The subject continued to play an important role in the political

8. *Report from the Select Committee,* etc. Senate Journals, 1929-30. No. S. 4. —F.3395.

9. Hansard, 17 Parl., 3rd Session, 1st Period, 2430, June 1, 1945. Statement by Mr. Hadley, Member for Lilley.

10. Jauncey, *op. cit.,* p. 261.

campaigns. This finally led to the appointment of a Royal Commission to inquire into the "Monetary and banking systems at present in operation in Australia". The Commission held hearings during most of 1936, and invited evidence from any interested party. In spite of their dissatisfaction with the existing banking system, very few Labor representatives appeared before the Commission. Several adherents of the Social Credit movement presented their argument for nationalization of banking as a device to put the profits of the banking business "into the pockets of the whole of the people". The majority of the witnesses before the Commission were representatives of banks who were in general agreement that some sort of central bank was needed, but that it should not be combined with a trading bank as was the Commonwealth Bank; this was regarded as unfair competition by the other trading banks.

In its report the Commission summarized the testimony and came to the not very startling conclusion that the voluntary co-operation of the trading banks was not always to be relied upon by the central bank; that on several occasions they had failed to follow the guidance of the central bank as to interest rates, or to supply needed information for the formulation of credit policy, or to sell essential foreign exchange to the central bank. The Commission recommended, therefore, that the powers of the Commonwealth Bank should be strengthened in several respects, to correct these defects. It did not, however, recommend the separation of the trading bank from the central bank. Mr. Chifley, the only Labor member of the Commission, was even at this early date consistently in favour of nationalization of banking, and filed vigorous dissent from the majority report, on the grounds that "no well-ordered progress can be made under a system in which there are privately-owned trading banks".

No new banking legislation was brought in immediately as the result of the Commission report. The Labor Party came back into office in 1941, and remained in power until 1949, but the exigencies of the war prevented consideration of banking matters until 1945. There had in the meantime been ample evidence that at least some sections of the Labor Party had not abandoned their programme for bank nationalization. During the Budget debate in October 1943, for example, when the policy of the government for that session of Parliament was under discussion, several Labor members expressed the hope that the Commonwealth Bank could be restored to "the hands of the people", and made into a "true people's bank"; one of them went so far as to say explicitly that "banking should be nationalized as soon as possible". Since Prime Minister Curtin had promised that there would be no nationalization of anything during the war, there was no possibility of changing the status of the banks at least until the war was over.[11]

With the end of the war in sight in 1945, and with everyone expecting a postwar depression, the Labor Government finally brought in a banking bill. The Commonwealth Bank was to be put under the

11. Hansard, 17 Parl., 1st Session, 298,365, p. 474.

control of a Governor to be appointed by the Governor-General of Australia (which meant, by the party in power), for a term of seven years, or during "good behaviour". The Governor would have an Advisory Council, also to be appointed by the party in power, to advise him "with respect to the monetary and banking policy of the bank, and any other matters referred to them by the Governor". The former Board of Directors of the bank was to be abolished. The Labor Party claimed that the Board had been composed of "nominees of the trading banks"; since the trading banks were, it was claimed, owned by the three "monopolies" of the country—the metals group, the sugar and tobacco group, and the overseas commerce group—the Board would inevitably represent the interests of big business and be opposed to the interests of Labor. The Liberal and Country Parties strongly opposed the abolition of the Board on the ground that its varied membership was more free of political control than a Governor could ever be.

Even the Liberal and Country members took no exception during the debate to the provisions for subordination of the bank to the Treasury. All parties were apparently in agreement that "in the event of any differences of opinion between the bank and the government on which they are unable to reach agreement, the Treasurer was to inform the bank of the policy which it must follow", and "the bank shall then give effect to that policy". The central bank of every one of the belligerents had of course been subservient to government policy during the war, but the relationship had never before been so baldly, not to say crudely, stated.

Nor did the opposition members object to the bill's Section 48 which later became so famous. It provided that no bank might conduct business for a government or a governmental agency without the written permission of the Treasurer. This section was practically ignored by both sides during the debate.

There was strong objection to the enactment into law of the provisions for Special Accounts, a device which had been used during the war under an administrative ruling, as a method for controlling bank expansion. The possible alternatives, such as required reserve ratios or quantitative limits, were hardly mentioned.

Much of the debate was mere reiteration of all previous debates on banking. One of the Labor Members explained his opposition to banks on the grounds that "my father was caught in the depression of 1893, and I was caught with thousands of other primary producers in the depression of 1933". The Opposition declared that the bill amounted to socialization or nationalization, and threatened that if passed it would sound the death knell of the Labor Party.[12]

In spite of protests and dire prophecies the Banking Act of 1945 was passed without serious amendment, and became law in August of that year. The Board of the Commonwealth Bank was replaced by the Advisory Council, with several members carried over from one to the

12. Hansard, 17 Parl., 3rd Session, 1st Period, 2419, June 1, 1945.

other—the Secretary of the Treasury (not to be confused with the Treasurer who is the Cabinet officer) and the Deputy Governor of the Bank. One representative of the Treasury and two officials of the Bank made up the remainder of the Council.

The relative moderation of the Act, compared to the extreme demands of the left wing of the Labor Party, at a time when Labor felt strongly entrenched and in control of both Houses of Parliament, was probably due to the influence of Chifley, who had been Treasurer throughout the war period, and who became Prime Minister as well as Treasurer in 1945. Although Chifley had long been on record as favouring nationalization of all banks in Australia he had opposed such action during the war, in part because he feared its effect on morale and war production, and in part because he felt bound by the promise of his predecessor, Prime Minister Curtin, not to nationalize anything under cover of the war.

Chifley had specifically opposed Section 48 of the Act, relating to government deposits in trading banks, not because of the principle involved but because he believed that it would only be an additional burden on the management of the Commonwealth Bank, already seriously understaffed as a result of the war. Moreover, many of the government units had overdrafts larger than their deposits, and there would have been little net gain to the Commonwealth Bank in taking them over. On this point, however, Chifley was overruled by his Cabinet, and he was able only to get their agreement that Section 48 should be applied gradually. Apparently no one then realized that this would become crucial.

In spite of the Cabinet agreement to proceed slowly, the extremists began to insist upon the application of Section 48. Chifley was finally persuaded in May 1947 to issue an order to two hundred local government bodies to transfer their deposits to the Commonwealth Bank on August 1. The trading banks were up in arms at once. They found allies in the Melbourne City Council, and in the tiny shire of Coreen, in New South Wales, which on May 28 lodged a writ in the High Court, challenging Section 48. On August 13 the Court upheld the contention that the section was invalid. Three days later, on a Saturday afternoon when most of the unsuspecting bankers were playing bowls or working in their gardens, the radio announced that the Prime Minister was going to take steps to nationalize the banks.

The Australian public was thunderstruck by the announcement. Even the Labor Caucus, the policy-making body of the party. was apparently taken by surprise. Its members, who were not conspicuous for their knowledge of finance, had to have a lengthy explanation from Chifley himself before they voted to uphold his decision. After this the Cabinet voted unanimously to support the nationalization, in spite of the fact that the two members farthest to the left in their views were abroad at the time. Once the decision was backed up by the party, Chifley proceeded to implement it without heed to the warnings of his friends and advisers.

Chifley was a man who by all accounts, along with his personal charm and his great intelligence, had considerable stubbornness once he had made up his mind. There seem to have been two principal reasons why he had determined upon this course at this time. In the first place he was infuriated by what he considered the ingratitude of the banks for the fact that he had saved them from nationalization in 1945. The least they could have done, he thought, was to co-operate with him in the relatively minor matter of Section 48; when they refused, and carried their case to court, he felt that they had no further claim upon his consideration. The decision of the Court took him entirely by surprise.

The second reason for this action at this particular time seems to have been that Chifley had just discovered that his long-desired scheme of nationalization could be carried through without any actual cost to the government. As he stated it in the Second Reading speech before Parliament:

> There will be no necessity for a parliamentary appropriation to provide for compensation. In acquiring the business of the private banks the Commonwealth Bank will also assume the liabilities of these institutions. The amount of compensation payable will necessarily have regard to this factor and it will be well within the capacity of the Commonwealth Bank to meet the payment from its own resources. The Commonwealth Bank will make payment in cash or government bonds as desired.

Neither of these factors was of course mentioned in the public explanation which he made of his decision on September 16, 1947. In this calm and urbane statement he declared:

> . . . the government is convinced that, because the problems of the postwar period, of employment, of development, of trade, are of such magnitude and involve such serious consequences, the government must accept responsibility for the economic condition of the nation and must have complete powers over banking policy to assist it in maintaining the national economic health and prosperity.
>
> . . . The dollar crisis is not yet solved and general economic conditions overseas are very unstable. It would be unwise not to be prepared for serious repercussions on the Australian economy in the near future.
>
> In 1931, overseas conditions precipitated the crisis in Australia. On that occasion the private trading banks refused to co-operate with the proposals made by the Commonwealth and State governments for the relief of unemployment and the revival of business activity. This should not be allowed to happen again.
>
> . . . In particular, the government is concerned about the Commonwealth Bank's control of the ebb and flow of credit under sections 18-22 of the Banking Act of 1945. . . . These sections have already been challenged in the statement of claim submitted by the Melbourne City Council in the recent case. . . . With economic difficulties increasing overseas, the government cannot leave the position in doubt.[13]

The Sections 18-22 to which Chifley referred in this speech were those which enacted into law the Special Account provisions. Chifley was much concerned lest they, too, be challenged in the courts, and declared invalid, thus leaving the Commonwealth Bank with inadequate means to control any inflationary credit expansion. The trading

13. Quoted in his *Things Worth Fighting For* (Melbourne, 1952), pp. 95-96.

banks were certainly opposed to the special accounts and would have been delighted to have them eliminated, but the legal grounds on which Section 48 was declared invalid were quite inapplicable to Sections 18-22. There seems to have been little reason for Chifley to fear such action.

It was relatively easy for the government to find plausible reasons for nationalization of banking, but the actual drafting of a bill which would accomplish this end and still stand the test of possible court action was far from simple. It was much more difficult in Australia than it had been in England, for example, where the nationalization of the Bank of England was accomplished in four short paragraphs and an appendix, or in France where the law provided only for the exchange of bank shares for government bonds and left all details for future legislation.

In Australia there was first of all the jurisdictional problem. Several of the banks held British charters, and about one-third of all the shareholders were believed to be outside of Australia mostly in England, with another one-sixth in New Zealand. Only about one-half were Australian. The capital amounts were distributed in approximately the same proportions. This made it necessary for the nationalization bill to provide two quite different devices for taking over ownership of the banks.[14]

There were other difficulties of a constitutional nature. The Australian constitution has no clause comparable to the "due process" of the American constitution, but there is a phrase requiring "just terms" whenever the government takes over property. Another problem arose from the fact that although there is no question about the right of the government to legislate on banking, there is no legal definition of what constitutes banking. So many problems of this nature arose, in fact, that Dr. Evatt, the Australian Attorney-General, was called home from a mission abroad to assist in the drafting of the bill. It is significant of the government's determination to press the matter that in spite of all the obstacles the completed bill was presented to Parliament on October 5, only two months after the original announcement.

The debate in Parliament lasted for about six weeks. Many of the points raised by the Members were depressingly similar to those of all the banking debates which had gone before. The spokesmen for the bill reiterated the importance of money and credit for the economy, and insisted that the banking system should not be allowed to be run for private profit; experience had shown that the private banking system in the past had over-expanded loans in good times, and had gone to the other extreme in periods of depression. The history of 1893 was revived, as well as the more recent difficulties of the 1930's.

Moreover the trading banks were accused of forming a monopoly because there was no real competition among them in interest rates and service charges. They stood together as a group against the efforts

14. *The Round Table*, March 1948, p. 610.

of the Commonwealth Bank to control credit, and the Banking Act of 1945, in spite of the increased power given to the central bank, was inadequate to protect the economy if a depression should occur.

The strongest case for nationalization was made, not by the perfervid Parliamentarians, but by several academic economists who prepared a pamphlet on the subject, the first in a series issued by the Fabian Society of New South Wales.[15] This pamphlet abandoned entirely the ill-founded charge that the banks were the cause of Australia's depressions. However, although the banks could not be charged with bringing on the depressions, neither could they be expected to cure them. Since only the government could undertake the policies necessary to ensure full employment, the banks must be nationalized so that these policies would be furthered and not hindered. The banks must be prevented from aggravating the instability of private investment and thus disturbing the equilibrium of the economy as a whole. Other advantages which might be expected from bank nationalization would be greater efficiency and more rapid modernization of bank techniques. The existing system of branch banking was extremely wasteful. With lowered costs of banking could come better and cheaper credit facilities for small farmers and new industries, and technical advisory services.

The authors of the pamphlet admitted that the nationalized banking system would be a monopoly by the Commonwealth, but thought that the existence of state-chartered banks which would not be affected by the change, would be a protection against the worst monopoly evils. They added that in any case a public monopoly was less dangerous than a private monopoly conducted for profit. If a nationalized bank were accused of discriminating against a customer, there was a legal right of appeal against the branch manager.

It seems rather curious that in all the argument for nationalization practically no mention was made of the fact that in 1945 both the Bank of England and the Bank of France had been nationalized, and that in France the four largest commercial banks had also been taken over by the government. Certainly the academic pamphleteers were aware of this, and used it as an argument for their case by saying: "... the Nazis, for very good reasons, never touched the private ownership of the banks, while democratic France has led the way in bank nationalization since the war". But one of the opponents of the Australian bill declared in Parliament that only in Soviet Russia had the banks been nationalized.[16] His statement was allowed to go uncontradicted by both the Laborites and the Opposition.

The case against nationalization, like the case for it, was argued more on political than on economic grounds. The opposition stressed the point that if private profit were to be made the test of economic virtue, there would be no room in Australia for any business run by

15. *The Case for Bank Nationalisation*, Pamphlet No. 1. New South Wales Fabian Society, Sydney. (Although issued without date or author, it is known that this pamphlet was written in 1947 by Messrs. H. W. Arndt and N. G. Butlin.)

16. Quoted in the Melbourne *Age*, October 16, 1947.

private enterprise—a statement with which the extreme left would of course have agreed. If on the other hand, the test was to be whether or not banking was an essential factor in the economy, it could be claimed with equal reason that all primary production was essential, as well as many other kinds of production; the Labor Party to be consistent would have to nationalize most production.

The trading banks were vigorously defended against the charge that they had brought about the 1930 depression by "destroying credit", and statistical evidence was offered to support the defence. They were praised for their co-operation with the Treasury during the war. There was little evidence offered to show that the banks were efficiently managed or that they provided adequate and inexpensive credit facilities.

Instead of preparing more of this type of evidence, the embattled trading banks were carrying on an active campaign throughout the country. Bank clerks were released from other duties to hand out circulars and address meetings. Rallies were held throughout the country; advertisements were placed in the principal newspapers. The argument that seems to have been most effective with the public was that nationalization of the banks would force everyone to deal with the government bank without any choice left; that it would destroy the privacy and secrecy of the individual's financial affairs, and that it was a first step in the socialization of all economic activity.

The government was so sure of its success that it did not carry on a campaign outside Parliament except for a few pamphlets. Indeed—and this may have been a sign of weakness—Chifley positively refused to hold a referendum on the question. The demand for a referendum had been made almost as soon as the nationalization plan was announced, and it was frequently reiterated in the following months. But Chifley declared that, although nationalization was not part of the latest fighting platform, the fact that Labor had been voted into office was sufficient evidence that the country was behind the party's general principles which were well known to include nationalization. Many in the Labor Party itself believed that Chifley was wrong in this interpretation. There had been two other referenda since the party had taken office, and both of them had indicated a somewhat lessened enthusiasm for increasing the powers of the government. In August 1944 when the Labor Party was at the peak of its popularity, it was decisively voted down in its request for larger powers for postwar reconstruction. And in 1946 although it obtained a favourable response to its request for increased power over social services, it was voted down on power to control marketing of primary products and conditions of industrial employment.[17]

Another clear indication of the popular temper was the election in the State of Victoria which occurred in November 1947. In order to force an election, the Legislative Council refused to vote the usual

17. *Australian Insurance and Banking Record*, LXXI, No. 9, November 22, 1947. Melbourne *Argus*, October 18, 1947.

supply bill of the Labor Government. The civil servants and railroad employees, left without their wages, struck for several hours in the middle of one day, and forced the Labor Government to resign and call an election. As a result of the vote, the Labor Government suffered a serious reversal, dropping from its majority of 127,000 votes of a year earlier, to 122,000 less than the other two parties; not a single seat was gained by the Labor Party. Although the Commonwealth Labor Party denied the significance of this vote, it was generally considered to be a repudiation of the nationalization policy. Several public opinion polls also indicated that a substantial majority of the public was opposed.[18]

By this time the nationalization bill had progressed so far in Parliament that it could hardly have been stopped even if the government had changed its mind. When it became almost certain that it was about to be passed, three of the trading banks and three of the State Governments took the unusual action of requesting the High Court to issue an injunction to restrain the Commonwealth from proceeding to carry out the terms of the Act until it could be tested in the courts. The reason for this request was the fear that once the Act became law, the Treasurer would move so fast in taking over the banks that it would be extremely difficult to unscramble them again.

The injunction was issued, and went into effect on November 27 when the bill was signed by the Governor-General. The banks then prepared to take their case before the High Court. During this period the government somewhat belatedly began to seek popular support by promising that under the new regime the two-penny stamp duty on cheques would be abolished, that inland exchange charges would be eliminated, and that interest rates on mortgages and public works would be reduced.[19]

The best legal talents in Australia were called in by both sides of the case, and so many of them that the High Court room in Melbourne had to be altered to make room for all the barristers attending.[20] The counsel for the Commonwealth were led by Dr. H. V. Evatt, the Federal Attorney-General, who had helped to draft the nationalization law, and who had himself been a judge of the High Court from 1930 to 1940. The counsel for the trading banks and the three associated State Governments—Victoria, South Australia and Western Australia —were headed by Mr. (now Sir Garfield) Barwick.

The case hinged on several constitutional questions. Although the constitution of Australia was modelled in many respects upon that of the United States, its terminology is different. The Commonwealth Government is specifically given the power to legislate upon "banking other than State banking" (Sec. 51, xiii). It also provides that where the government takes over property, the acquisition shall be on "just terms" (Sec. 51, xxxi). Most important of all, in this case, was

18. Melbourne *Age*, October, November, 1947, *passim*. *The Round Table*, March 1948 p. 614.
19. Melbourne *Argus*, November 28, 1947.
20. Melbourne *Age*, February 5, 1948.

the provision in Sec. 92 that "trade, commerce and intercourse among the States, whether by means of internal carriage or ocean navigation, shall be absolutely free". This clause was put into the constitution to prevent import and tariff restrictions from being set up by the States against each other, but its interpretation has been steadily widened by the courts; recently it has been used to keep the Commonwealth from nationalizing a private air line.

Much of the argument before the High Court was devoted to the question whether taking over the privately-owned trading banks by the Commonwealth Bank was really a regulation of "banking". There was also a great deal of what to a non-legal mind seems like quibbling over such points as whether the sending of funds by telegraphic transfer was really interstate "trade". With many such fine points to be considered, the case dragged on for thirty-nine days, at a total cost estimated to be about £A100,000.

A decision was finally handed down on August 11, 1948, a year after the Bill had been introduced into Parliament. The Court, by a majority, held that the provisions of the Act which authorized the prohibition of private banking in Australia were invalid because they violated the constitutional guarantee of inter-State freedom of trade, commerce and intercourse (Sec. 92 of the Constitution). A number of other provisions of the Act were also held invalid. Those provisions related to: the compulsory acquisition of shares in private banking companies, the appointment of directors to manage the affairs of the private banks, the acquisition of the businesses and assets of the private banks in Australia, the assessment of compensation for acquisitions made, the inspection of records of private banks and the assistance required from directors and other officers of the banks in the transferring to the Commonwealth of the private banking businesses. The reasons given for the invalidity of those provisions were various and complicated, and with respect to all but one of the provisions the Court was divided. The report of the case covers 400 pages of the Commonwealth Law Reports. Suffice it to say that, although there was at least a majority of the Court for deciding the invalidity of each of the provisions referred to, it is difficult to discover a majority of the Court agreeing on the reasons for such invalidity, with the exception of the prohibition provisions which were held invalid as infringing inter-State free trade.

The Hight Court made an order restraining the Commonwealth and its officers from taking any steps to implement or enforce the provisions of the Act declared to be invalid. The Commonwealth was, of course, ordered to pay the costs of the proceedings.

The Government leaders decided almost immediately to appeal to the Privy Council in England. It was clear that, on most of the issues fought out in the High Court, the Australian Constitution prevented such an appeal without first obtaining permission from the High Court. It was thought, however, that an appeal could be taken on the question whether or not the prohibition provisions violated Sec. 92 of the Constitution without first obtaining the High Court's permission.

The Commonwealth decided therefore to limit its appeal to the question of the validity of those prohibition provisions. The hearings before the Privy Council opened on March 14, 1949. Like the original proceedings in Australia, the hearings in London were protracted. The Privy Council dismissed the appeal in July 1949, but it was not until October 26, 1949, that the reasons for decision were handed down. The Privy Council held that the appeal was incompetent without a certificate from the High Court permitting it. Because of the abnormal length of the arguments that had been permitted on the substance of the matter, however, and to settle doubts that would have otherwise remained, the Privy Council expressed an opinion on the validity of the provisions concerned. That opinion affirmed the views of the majority of the High Court and, in the event, the position of the trading banks and the associated States was completely vindicated.

While the status of the nationalization act remained in doubt, several Australian States were making plans to circumvent the Commonwealth Government in case of a favourable court decision, and to prevent it from obtaining a monopoly of commercial banking. New South Wales had established the Rural Bank of New South Wales to aid the farmers. This State bank was empowered by law passed in February 1948 to carry on a general banking business, so that if the trading banks were nationalized, there would be a State bank ready to provide competition; many customers would undoubtedly have transferred their accounts to it from the Commonwealth Bank's trading department. In the State of Victoria the Country Party campaigned during November 1947 on the promise to expand the State Savings Bank into a commercial bank, to serve also as fiscal agent for the State. In South Australia the Government planned, if necessary, to amalgamate the Savings Bank of South Australia with the State Savings Bank, and to widen their activities to cover all commercial banking functions.[22]

How far these threats would actually have been carried out, had the court decision been different, is hard to say, but there was certainly a very strong current of resistance to the plans of the Federal Government. This might well have made it impossible, even if the nationalization had been carried out, to achieve the aim of providing centralized control of the credit system. A series of State banks, each acting in the light of its own local and sectional interests, could have been far more dangerous to economic stability than the existing system of trading banks, each of which had a nation-wide network of branch offices and a diversity of economic interests that fostered a consideration of national as opposed to exclusively local prosperity. There seems to be good reason to question whether the nationalization could ever have functioned as Chifley had hoped it would.

The effect on the political fortunes of the Labor Party was as bad as Chifley's most pessimistic advisers had feared. The overturn of Labor in the State of Victoria in the autumn of 1947 was just as the

22. Melbourne *Age*, November 1, 1947. Melbourne *Argus*, August 20, 1947.

anti-Labor parties had claimed, the turning of the tide. Two other measures increased the unpopularity of the Chifley Government about this time. One was his refusal to de-ration petrol—he feared that gasoline purchases from the dollar area would increase and make the sterling area's problem still more difficult. The second was his insistence that medical fees be fixed, thus creating another strong bloc in opposition to the government. When the results of the Federal elections were in, late in 1949, the Labor Party had been decisively defeated, and held only 47 of the 120 seats in the House; it had also lost its majority in the Senate. The Liberal-Country Party coalition took office, with Menzies as Prime Minister.

Nearly a decade has passed since the decision of the Privy Council. Almost every session of Parliament under the Liberal-Country Party regime has tried to change the banking law in the effort to make another attempt at nationalization, by a possible Labor Party government of the future, either difficult or futile or both. The first of these attempts, which aimed at restoring the ten-member Board of Directors of the Commonwealth Bank, was strongly contested by the Labor members of both houses. But Prime Minister Menzies was so sure of his strength not only on this but also on other questions, that he risked a double dissolution of parliament early in 1951, and was returned to office with a stronger position than before. The banking bill which had been at issue became law in July 1951.

Two years later Mr. Menzies brought in another banking bill which took several more steps towards freeing the trading banks from the possibility of absorption or even control by the central bank. In the first place the Commonwealth Trading Bank was to have its own manager. It was still under the same Board of Directors as the Commonwealth Bank, to be sure, but as a separate entity, required to follow the same rules regarding Special Accounts and the like as the other trading banks. The principal purpose of this provision was to put the Commonwealth Trading Bank on a competitive footing with the other banks, and to take away its special privileges.

The second major change in this bill was in connection with the Special Accounts. These had been used during and after the war, as a device for reducing the lending ability of the banks and thus preventing inflation. The Special Accounts were based upon the increases in bank deposits from the starting point in 1941; since the increases during the war and the postwar period had been large, it would have been possible for the central bank to "strangle" the trading banks by this means, had it been so minded.[23] The change which was now made was first of all, to establish a new starting point every year, from which increases in deposits were to be measured, and then to limit the amount which could be called into special deposit, to a fraction of the increase. In this way the trading banks would be protected from large and unexpected calls. The usual points were raised in the debate, but the bill became law in April 1953.

23. *Australian Insurance and Banking Record,* LXXVI, p. 494, November 21, 1952.

During the next four years the banking atmosphere seemed to be calmer. The central bank behaved with moderation, and determined its credit policies in consultation with the trading banks, obtaining a large measure of co-operation from them as a result.[24] But apparently, in spite of the changes in the banking law and the discretion of the central bank, the trading banks still felt highly insecure. In 1957, therefore, another set of banking bills was brought in by Prime Minister Menzies. The most important change which they proposed was the splitting of the Commonwealth Bank group into three separate parts—a central bank, a trading bank, and a development bank, with complete separation of staff and of banking offices. The central bank would have been renamed the Reserve Bank of Australia. Its functions would have changed very little, but the Special Account system of reserves would have been altered somewhat.

The greatest innovation was in the reorganization of the other functions. A new corporation, the Commonwealth Banking Corporation, was to be formed, with a Board of eleven members, three of them ex-officio, and eight appointed by the Government. This Board was to set up from its own members an Executive Committee for the Trading Bank, for the Savings Bank and for the Development Bank. The first two of these remained much as they had under previous legislation. However, the Trading Bank was now to compete actively with the other trading banks under the express provision that "the Trading Bank shall not refuse to conduct banking business for a person by reason only of the fact that to conduct that business would have the effect of taking away business from another bank". It seems surprising that the private trading banks should have been so enthusiastic in their support of a measure which included such a provision.

The new Development Bank was designed to take the place of the old Mortgage Bank and Industrial Finance Department of the Commonwealth Bank. Its functions were to provide credit for primary production, and the establishment or development of industrial undertakings, particularly small undertakings; also to provide technical advice and assistance to such enterprises. A few of the more cautious members of the financial community pointed out that this bank, almost free of control or reserve requirements, might well "drain the trading banking system dry".[25]

The banking bills as a group were well integrated and would have moved the Australian financial system another step in the direction taken by most highly industrialized nations with strong central banks. But the legislation never had a chance to be considered on its merits. The Liberal Party followed the lead of their Prime Minister in considering it as a protection of the trading banks from the possibility of future nationalization, and the trading banks refused to analyze it objectively to see if it would really help their position or hurt it. The Country Party members showed little enthusiasm for it until the

24. H. W. Arndt, *The Australian Trading Banks, passim.*
25. *The Financial Review,* November 7, 1957, p. 3.

Treasurer, Sir Arthur Fadden, was brought into line by the proposal for a Development Bank to make credit easier for farmers.

The Labor Party, because the bills were proposed by their political enemies, refused to see anything good in them. Although it was impossible to defeat them in the House, Labor managed to keep the vote in the Senate to a tie by the desperate expedient of mustering their members from hospital beds and wheel chairs. Mr. Menzies could have called for a dissolution, but he did not, since a general election was due in any case within a year, in November 1958.[26]

Under such circumstances there is little hope for well-considered banking legislation. Australia is developing rapidly into a highly industrialized nation, and her banks are keeping pace in spite of their traditional conservatism. But many improvements in the general structure of the financial system and in the relations between the central bank and the commercial bank will have to be made during the next few years if there is to be a modern money market with adequate facilities for handling savings, investment, and bank credit. Certainly nationalization is not a simple or an adequate solution, even if it were politically feasible.

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26. Since this article was written, the Menzies Government has been again returned to power, this time with a majority in the Senate. All the Banking legislation described in the text was resubmitted and passed into law, and will shortly come into operation.—EDITOR.

THE CONDITIONS FOR OLIGOPOLISTIC PRICE INTERDEPENDENCE

1. *What is Oligopoly?*

A few years ago, in the course of a review of Bain's *Pricing, Distribution and Employment,* Stigler said: "Bain believes that the economy is overwhelmingly oligopolistic. . . . My own tentative estimates . . . suggest that . . . competition is three or four times as important as all other forms of market organization combined."[1] Here, then, we have crystallized for us an impression one cannot escape in any reading of value discussions over the past twenty years or so. For one economist oligopoly is the exception; for the next it is the rule. Interestingly enough, this fundamental split emerges even in the camp of the empiricists. Thus, for Hall and Hitch, oligopoly is virtually ubiquitous: ". . . the typical case is that of monopolistic competition with an admixture, which is usually large, of oligopoly".[2] Clearly it is this aspect of the Hall-Hitch thesis which disturbed Andrews so much and, in large part, accounts for his pains to insist on the competitiveness of industry.[3] In fact, it is this, one suspects, which constitutes the real substance of the distinction between a price based on "full cost" and a price determined by average prime cost plus a "costing margin".

It hardly seems necessary to stress the important implications which flow from one's judgment about the market-structure and, in particular, the pervasiveness of oligopoly in the economy. It will influence one's views about the adaptability of the economy to change, the reaction of prices—as distinct from output—to changes in effective demand, the role of anti-trust policies, and so on. It is, therefore, a serious commentary upon our theoretical principles of market classification, and especially upon our criteria for distinguishing oligopoly, that such widely divergent judgments among professional economists should exist. The question naturally poses itself: What is the source of this deep-seated cleavage in opinion?

Ever since the publication of Chamberlin's *Theory of Monopolistic Competition* there have been two distinct conceptions of oligopoly. The first (and older) sense is that involving the literal notion of "fewness", often associated with overtones about size. But there is a second conception of oligopoly which is more general in modern value analysis. In this case, oligopoly is defined in terms of the transmissability of price changes. Thus, as Triffin has it, "the crux of the distinction between large and small numbers is really whether or not a price move by one seller induces the other sellers to follow suit. . . ."[4] It is in these terms that Chamberlin defined oligopoly. Yet, by and large, the matter has been left at this definitional stage; the conditions (of de-

1. *American Economic Review,* December 1948, p. 915.
2. R. L. Hall and C. J. Hitch: "Price Theory and Business Behaviour" *Oxford Economic Papers,* No. 2 (1939).
3. P. W. S. Andrews: *Manufacturing Business,* London, 1949.
4. *Monopolistic Competition and General Equilibrium Theory,* Cambridge Mass., 1941, p. 30.

mand and/or supply) which give rise to "price interdependence", as Triffin calls it, have not been stated except by way of vague inference, nor has there been any adequate explanation of the precise relationship between price interdependence and fewness.

In the old scheme—where commodities were different in kind, not merely in degree—the connection between numbers and a firm's influence on market price was clear enough. A simple quantity criterion was sufficient. If a firm's output were small compared with total market supply, then any price-output decision of that firm could have only a negligible effect on market price; and vice versa where one firm contributed a substantial fraction of total market supply. However, it should be noticed in passing that this criterion implied some restriction upon the supply *potentiality* of the individual firm. This condition was made explicit in the U-shaped cost curve.

But in the modern scheme, where commodities are merely different in degree, a simple quantity criterion is no longer adequate. Products differ in substitutability between one and the other. In determining price interdependence we now require two criteria: numbers (in some sense) *and* the degree of substitutability between products. Thus, we are left with two problems. First, how do we take account of the number of firms when products are dissimilar? Simple counting will not do since strictly speaking we can only count like things; nor is it immediately apparent at what point enumeration should end. Second, in what manner do the criteria of substitutability and "numbers" interact to produce price interdependence, or to avoid it? Furthermore, we may no longer automatically imply restrictions upon firms' potential outputs, since in the generality of monopolistic competition decreasing costs are quite consistent with equilibrium, even when large numbers are involved. It is with these matters that the present paper is concerned.

2. *From Chamberlin to Triffin*

It is not proposed here to journey through the voluminous and often contradictory literature which discusses the criteria for oligopoly under conditions of monopolistic competition. This territory has already been admirably surveyed by Professor R. L. Bishop.[5] Nevertheless, it will help to focus our problem if we briefly look at the source of subsequent confusion in Chamberlin's original work and Triffin's adaptation of it, since these are by way of being the standard texts on the subject.

Chamberlin distinguished the "large group" from the "small group" in the following terms:

> "Specifically, we assume for the present that any adjustment of price or of 'product' by a single producer spreads its influence over so many of his competitors that the impact felt by any one is negligible and does not lead to any readjustment of his own situation."[6]

5. "Elasticities, Cross-Elasticities, and Market Relationships", *American Economic Review*, December 1952.

6. *Theory of Monopolistic Competition*, 3rd Ed., Cambridge, Mass., 1938, p. 83.

It is easy to see how this criterion is derived, by analogy, from the case of homogeneous products. It purports to provide a simple quantity criterion in the old manner. However, like most analogies, it breaks down under examination. In the generality of monopolistic competition, changes in offer prices must be finite. It follows that the *quantity* impact of a price move by one firm on the sales of another will not be independent of the *size* of the price change. Nor, as we saw above, can we automatically set an upper limit to the size of any such price cut because of increasing costs.

This failure of a simple quantity criterion of numbers in conditions of monopolistic competition does not seem to have been generally appreciated. Thus, to take a case at random, Papandreou asks: "How large must the number of firms in an industry be in order that it may fall in the category of a large-number-of-firms industry? . . . The number must be so large that firms cannot influence one another's *volume* of sales by cutting price."[7] However, in the general case of monopolistic competition, we can, theoretically, always make the volume of sales transferred as a result of a price-cut as small (large) as we like, if we make the price-cut small (large) enough.

This seems to have been in Triffin's mind when he re-stated Chamberlin's criterion symbolically, when its real weakness becomes apparent (although not to Triffin). Thus, he says, oligopolistic interdependence between firms i and j will be absent if "$\frac{\delta R_i}{\delta p_j}$ is of insignificant size",[8] where δR_i is the revenue lost by i in response to a price-cut of δp_j by j. The impact upon i is now specifically related to the size of the price-cut invoked by j. This ratio, Triffin claims, summarizes Chamberlin's numbers criterion and, given Chamberlin's symmetry assumptions, is perfectly adequate.

Unfortunately, however, this more precise formulation of Chamberlin's numbers criterion leads immediately to a coefficient of substitution. The ratio will be large when a small price-cut by j is sufficient to take a large amount of revenue from i, i.e. when i and j are good substitutes. It will be small when it requires a substantial price-cut by j to attract a few sales from i, i.e. when i and j are poor substitutes. And this is precisely the position to which Triffin is led. First, he makes two minor modifications to the coefficient: (1) he expresses the impact upon i in terms of output instead of revenue, merely for the purpose of bringing symmetry into his own exposition; and (2) he expresses the price and quantity changes as relatives, i.e. in elasticity form, to allow for asymmetrical relationships. The coefficient then becomes $\frac{p_j \delta q_i}{q_i \delta p_j}$ which is the ordinary form of price cross-elasticity of demand.

Having derived this coefficient directly from Chamberlin's numbers criterion, Triffin immediately proceeds to use it as his substitution criterion. With it he distinguishes the three categories: homogeneous

7. "Market Structure and Monopoly Power", *American Economic Review*, Sept. 1949, p. 888. My emphasis.
8. R. Triffin, *op. cit.*, p. 100.

competition, heterogeneous competition, and isolated selling.[9] It tells us nothing of numbers at all, for Triffin himself agrees that either of his first two categories, viz. homogeneous and heterogeneous competition, may be either oligopolistic (circular) or non-oligopolistic (atomistic). Indeed, he introduces another coefficient altogether to distinguish the sub-categories according to numbers.[10]

Nothing could better demonstrate the amazing confusion that has grown up around the concept of cross-elasticity of demand,[11] and in particular the widespread belief that it in some way reflects the number of firms in a given market area, than the fact that Triffin can, without apparent challenge, derive a coefficient specifically as a numbers criterion and use it at once as his criterion for substitutability, although he sometimes backslides and claims it measures numbers (p. 138). He makes this switch, not as an aberration in the footnotes, but at the very heart of his system. Not only does he apparently get away with it, but it is adopted by others. Indeed, it seems to satisfy both major camps. For those who consider cross-elasticity essentially as a numbers criterion, there is the explicit derivation from Chamberlin's numbers condition, not to mention a numbers coefficient of Triffin's own which looks very much like cross-elasticity. For those who believe that price cross-elasticity of demand is a substitution criterion, there is Triffin's open use of it as such. In so far as the provision of a numbers criterion is concerned, then, Triffin's development of Chamberlin's criterion ends in confusion, although this has not deterred Chamberlin from subsequent reassertion of his numbers criterion in terms of cross-elasticity.[12]

3. *The Determinants of Price Interdependence*

We have to determine under what conditions a price-cut by one seller will induce a significant price-reaction by other sellers. We make the following assumptions:

(1) All demand functions are linear, at least over relevant ranges;
(2) All firms unilaterally attempt to maximize profits by equation of marginal cost and marginal revenue;[13] and
(3) Marginal costs are constant over the relevant range. (This assumption will be abandoned later.)

Then the equation of the demand curve for any firm j related to firm i, which we take to be the firm initiating the price move, will be—

$$p = k - mq \qquad (m > 0)^{14}$$

9. R. Triffin, *op. cit.*, p. 104.
10. Triffin, of course, claims to have abandoned the concept of numbers altogether, but inevitably it is there under another name. The distinction between the terms "large numbers" and "atomistic" is very fine indeed.
11. See my "Elasticities, Cross-Elasticities, and Market Relationships: Comment", *American Economic Review*, June 1955.
12. e.g., in *Towards a More General Theory of Value*, New York, 1957, Ch. 4.
13. If firms do not act unilaterally, we must have a species of collusive monopoly, by definition.
14. We cannot at this stage embrace the limiting case where $m = 0$ (homogeneous competition), since it would be inconsistent with our temporary assumption of constant marginal costs.

where k is an arbitrary constant and m is the negative slope of the demand curve. If R is total revenue, then—

$$R = pq = kq - mq^2$$

and marginal revenue is given by—

$$\frac{dR}{dq} = k - 2mq.$$

Then, if c is marginal cost,

$$k - 2mq = c$$

in the initial equilibrium situation. If we use the upper suffix "zero" to denote initial values, then—

$$q^0_j = \frac{1}{2m}(k - c) \qquad (1)$$

and

$$p^0_j = \tfrac{1}{2}(k + c). \qquad (2)$$

We now suppose firm i to initiate, autonomously, a given price-cut, Δp_i. This will have the effect of attracting a quantity of sales, I, from firm j to i. Consequently, j's demand curve will shift downwards and become—

$$p = k - m(q + I).$$

However, other firms $a, b, \ldots n$ also related to i will have cause to adjust their prices to greater or lesser degree in response to i's price move. All such adjustments will also have the effect of lowering j's demand curve, depending upon the degree of relationship between these firms and j. Hence, j's demand curve, after all adjustments by related firms have been taken account of, will be—

$$p = k - m(q + A + B + \ldots + I + \ldots + N),$$

where the $A, B, \ldots N$ represent the quantities which would be attracted from j by the price-cuts of $a, b, \ldots n$. (It should be noticed that j's demand curve will be affected to the extent of the full *potential* impact of other firms' price-cuts upon j's sales. The fact that j may have cut price in the same proportion as all or any of these related firms, so that, in the event, j may not suffer any *actual* loss of sales to those firms, is irrelevant here; for although j may retain its customers by appropriate price action, it necessarily does so at a lower price, i.e. on a lower demand curve.)

In the new situation—

$$R = kq - mq^2 - mq(A + B + \ldots + I + \ldots + N),$$

and

$$\frac{dR}{dq} = k - 2mq - m(A + B + \ldots + I + \ldots + N) = c.$$

Then, j's new output, when all adjustments have been carried through, denoted by q'_j, will be—

$$q'_j = \frac{1}{2m}(k - c - m\overline{A + B + \ldots + I + \ldots + N}) \qquad (3)$$

and

$$p'_j = \tfrac{1}{2}(k + c - m\overline{A + B + \ldots + I + \ldots + N}). \qquad (4)$$

Deducting (4) from (2), we get the full extent of j's price-reaction to the initial move by i and the induced price-cuts of related firms—

$$p^0{}_j - p'_j = \tfrac{1}{2}m\,(A + B + \ldots + I + \ldots + N). \qquad (5)$$

The relative price-reaction which we will denote by $\bar{p}_j$ will be—

$$\bar{p}_j = \frac{p^0{}_j - p'_j}{p^0{}_j} = \frac{m}{2p^0{}_j}(A + B + \ldots + I + \ldots + N).$$

Since $-m$ is the slope of j's demand curve, $q^0{}_j m/p^0{}_j$ is the negative reciprocal of j's initial "own" elasticity of demand, E_{jj}. If we henceforth take the E_{jj} in the positive sense, then—

$$\bar{p}_j = \frac{1}{2E_{jj}} \frac{(A + B + \ldots + I + \ldots + N)}{q^0{}_j}.$$

Further, $I/q^0{}_j\bar{p}_i$ is the arc cross-elasticity of demand of firm j with respect to the price of i. Therefore, $Iq^0{}_j = \bar{p}_i E_{ji}$ and—

$$\bar{p}_j = \frac{1}{2E_{jj}}(\bar{p}_a E_{ja} + \bar{p}_b E_{jb} + \ldots + \bar{p}_i E_{ji} + \ldots + \bar{p}_n E_{jn}).$$

Now in deciding whether or not $\bar{p}_j$ represents a significant reaction, we are really interested in its magnitude *in relation to* the size of i's initiating price-cut. Therefore, if we denoted $\bar{p}_j/\bar{p}_i$ by ϕ_j, and also put $z_{ji} = E_{ji}/E_{jj}$ we get—

$$\phi_j = \tfrac{1}{2}(z_{ja}\phi_a + z_{jb}\phi_b + \ldots + z_{ji} + \ldots + z_{jn}\phi_n).$$

Of course, the same position will hold simultaneously for all $n-1$ firms related to i, so that we obtain the system of linear equations—

$$\begin{aligned}
2\phi_a - z_{ab}\phi_b - \ldots - z_{aj}\phi_j - \ldots - z_{an}\phi_n &= z_{ai}\\
-z_{ba}\phi_a + 2\phi_b - \ldots - z_{bj}\phi_j - \ldots - z_{bn}\phi_n &= z_{bi}\\
\vdots \quad\quad \vdots \quad\quad\quad \vdots \quad\quad\quad \vdots &\\
-z_{ja}\phi_a - z_{jb}\phi_b - \ldots + 2\phi_j - \ldots - z_{jn}\phi_n &= z_{ji}\\
\vdots \quad\quad \vdots \quad\quad\quad \vdots \quad\quad\quad \vdots &\\
-z_{na}\phi_a - z_{nb}\phi_b - \ldots - z_{nj}\phi_j - \ldots + 2\phi_n &= z_{ni}.
\end{aligned}$$

These may be solved for the ϕ in the form—

$$\underset{\sim}{\phi} = \underset{\sim}{Z}^{-1}\underset{\sim}{z},$$

where $\underset{\sim}{Z}$ is the matrix—

$$\begin{bmatrix}
2 & -z_{ab} \ldots -z_{aj} \ldots -z_{an}\\
-z_{ba} & 2 \ldots -z_{bj} \ldots -z_{bn}\\
\vdots & \vdots \quad\quad \vdots \quad\quad \vdots\\
-z_{ja} & -z_{jb} \ldots 2 \ldots -z_{jn}\\
\vdots & \vdots \quad\quad \vdots \quad\quad \vdots\\
-z_{na} & -z_{nb} \ldots -z_{nj} \ldots 2
\end{bmatrix}.$$

4. *Preliminary Conclusion*

The simple significance of this result may be seen at once if we invoke symmetry assumptions, viz. that the $E_{aa} = E_{jj}$ and $E_{ai} = E_{ji}$, and ignore extra-group relationships as negligible. Since on these

assumptions $z = E_{ji}/E_{jj} = \frac{1}{n-1}$, where n is the number of firms and $n-1$ is the rank of our matrix, then—

$$\phi = \frac{z}{2-(n-2)z} = \frac{z}{z+1} = \frac{1}{n}$$

Here then we have stated for symmetry conditions a simple relationship between the number of firms and the impact of a price-cut by one seller upon the price policy of another. Where n is large, j's price-reaction will be insignificant *in relation to* an automonous price move by i.

Since the parameters of our system of equations are the $z_{ji} = E_{ji}/E_{jj}$, it will be appreciated at once that oligopolistic interdependence does not depend on cross-elasticity of demand, as many writers including Chamberlin believe, but upon the ratio of cross-elasticity and "own" elasticity of demand, as Bishop has strongly insisted elsewhere.[15] Bishop has suggested the reciprocal of this ratio as a "numbers equivalent" on the grounds that it is better suited to asymmetrical situations than a simple numerical criterion. However, two important qualifications must be added. First, under asymmetrical conditions price interdependence will depend upon the whole pattern of these ratios as between *all* related firms, not merely between any two of them. Second, in the case of isolated selling or pure monopoly where a large number of firms are very weakly related, it would seem better to describe the non-interdependence of prices as due to small cross-elasticities (failure of the substitution criterion for oligopoly) rather than in Bishop's terms of a large "numbers equivalent" (failure of the numbers criterion). It is a *sufficient* condition for non-interdependence that the numerators of the z_{ji}, i.e. the cross-elasticities of demand, be small.

5. *Mrs. Robinson's Demand Curve*

It has often been said that Mrs. Robinson side-stepped the oligopoly problem when she declared—

> "The demand curve for the individual firm may be conceived to show the full effect upon the sales of that firm which results from any change in the price which it charges, whether it causes a change in the prices charged by the others or not."[16]

In the event, it may be that a good deal of the confusion subsequent to the advent of monopolistic and/or imperfect competition theory would have been avoided had this definition of the demand curve for the firm been investigated further.

Still taking "own" elasticity in the positive sense, by definition—

$$E_{ii} = \frac{q_a}{q_i}E_{ai} + \frac{q_b}{q_i}E_{bi} + \ldots + \frac{q_j}{q_i}E_{ji} + \ldots + \frac{q_n}{q_i}E_{ni}$$

where the sum is taken over all firms whose cross-elasticities with i are not zero. If we call $\overline{E}_{ji}$ the weighted cross-elasticity of j with respect to the price of i,

$$E_{ii} = \overline{E}_{ai} + \overline{E}_{bi} + \ldots + \overline{E}_{ji} + \ldots + \overline{E}_{ni}.$$

15. R. L. Bishop, *loc. cit.*
16. Joan Robinson, *Economics of Imperfect Competition*, p. 21.

Now E_{ii} is normally defined on the assumption that all other prices are unchanged. However, using our earlier results, we may now define an *effective* elasticity of demand, ϵ_{ii}, which will take account of price-reactions in the manner of Mrs. Robinson. Thus,

$$\epsilon_{ii} = (1-\phi_a)\,\bar{E}_{ai} + (1-\phi_b)\,\bar{E}_{bi} + \ldots + (1-\phi_n)\,\bar{E}_{ni}$$
$$= E_{ii} - (\phi_a \bar{E}_{ai} + \phi_b \bar{E}_{bi} + \ldots + \phi_n \bar{E}_{ni})$$

or in the symmetrical case

$$\epsilon_{ii} = (1-\phi)\,E_{ii}.$$

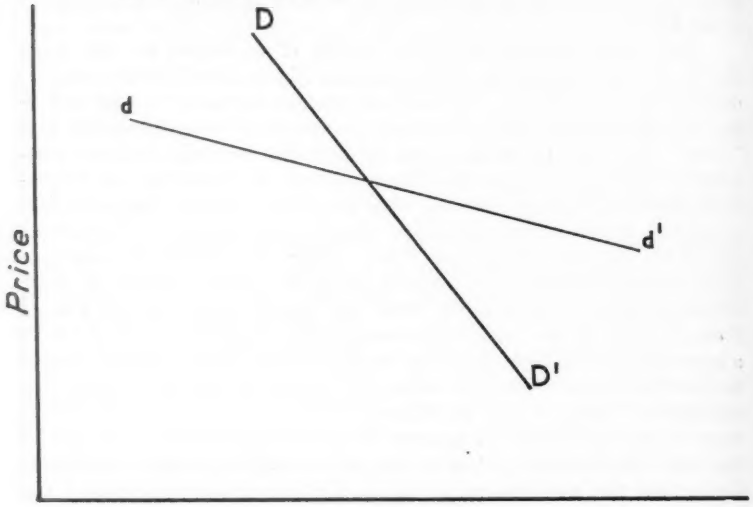

FIG. 1

We may now draw two demand curves for any firm i, dd' as ordinarily defined and DD' as Mrs. Robinson defines it. It has been customary to take the elasticity of dd' as an index of the degree of market imperfection. By analogy, we may take the elasticity of DD' (not to be confused with Chamberlin's DD') as an index of the degree of market imperfection + oligopoly, if we rule out collusion, when we have a situation of collusive monopoly (involving the group or industry demand curve) rather than oligopoly proper.

6. *Changes in Marginal Cost*

If we drop our assumption of constant marginal costs, we get (5) in the form—

$$p^0_j - p'_j = \tfrac{1}{2}m(A + B + \ldots + I + \ldots + N) + \tfrac{1}{2}(c^0 - c').$$

Then, if $c^0 - c'/q^0 - q' = s$ is the slope of j's MC curve, where $q^0 - q' - (3)$ *from* (1) — is the actual change in j's output resulting from the total readjustment, it may readily be verified that—

$$p^0_j - p'_j = \frac{(2m+2s)}{(2m+s)}\,(\tfrac{1}{2}mA + B + \ldots + I + \ldots + N).$$

Put r, the negative slope of the marginal revenue curve, for $2m$; and let $\mu_j = \dfrac{r+2s}{r+s}$. Then, if we denote the price-reaction of firm j when account is taken of variations in MC by ϕ'_j,

$$\phi'_j = \tfrac{1}{2}\mu_j(z_{ja}\phi'_a + z_{jb}\phi'_b + \ldots + z_{j\mu} + \ldots + z_{jn}\phi'_n)$$

and similarly for all other firms. The solution is now of the form—

$$\underset{\sim}{\phi'} = \underset{\sim}{Y}^{-1}\underset{\sim}{y}$$

where the non-diagonal elements of the matrix are now the $y_{j\mu} = \mu_j z_{j\mu}$.

It is interesting to consider the behaviour of μ.

(a) *Positively (upward) sloping MC:* when $0 < s < \infty$, $1 < \mu < 2$.

(b) *Constant MC:* $\mu = 1$ (our earlier result).

(c) *Negatively sloping MC:* when $-\tfrac{1}{2}r \leqslant s < 0$, $0 \leqslant \mu < 1$. (But theoretically s may take values approaching $-r$, at which value the MC and MR curves are parallel and no equilibrium is defined. If $s < -r$, MC cuts MR from above and no stable equilibrium is possible. Then, if $-r < s < -\tfrac{1}{2}r$, $\mu < 0$, in which extremely unlikely case the reaction would take the form of a price *rise*.)

In general, then, increasing marginal costs in related firms will tend to increase their price-reaction to an autonomous move by any firm i; decreasing marginal costs will tend to diminish that reaction. To say the least, this result, derived upon the basis of the assumptions of traditional theory, is surprising. One would have thought, as a matter of common sense, that firms would be much more reluctant to lose marginal sales subject to decreasing costs than those involving increasing costs. Perhaps firms do in fact see the matter in this way. If they do, then so much the worse for traditional theory.[17]

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17. The paradox arises out of the fact that formal equilibrium always depends on *rising* costs relative to demand, i.e. MC must cut MR from below. With falling MC, a fall in the demand curve implies equation of MC and MR at a higher level than in the initial situation.

THE EQUALITY OF REPLACEMENT AND DEPRECIATION*

I

In the literature on theories of growth and fluctuations the problem of the relation between investment and the expansion of the productive capacity of the economy has been a central feature; capital stock adjustment models form the basis of most recent contributions. Yet there is a fundamental assumption running through most of these theories which has not been fully investigated. It is the identification of net of depreciation investment with productive capacity. It is held, in effect, that annual depreciation is an accurate measure of the deterioration in the physical capacity of the capital stock in any one year. Unless one can show that such capacity does decline with the accumulation of depreciation allowances, no real correspondence can be said to exist between annual investment, net of depreciation, and annual investment net of replacement. In this context, replacement may be defined as the replacement of the output of one capital good with a similar output from another piece of capital equipment.

The difficulty of equating annual replacement with annual depreciation was recognized by Keynes even though he treated the matter as an unnecessary digression from his main topic.[1] Perhaps more attention would have been given to the point if considerations of remedies for unemployment had not pushed the relationship between output and the capital stock into a relatively minor role in his schema. Some years ago Domar and Eisner took up the question again in order to see what modifications might be necessary in growth theory.[2] The findings in both investigations showed up the discrepancy between the two aggregates in a growing economy.

Domar's general model illustrating the dichotomy between annual replacement and annual depreciation is based upon a number of assumptions. In the first place each asset has a definite life-span and output remains constant over the life of the asset—this is the "one-hoss shay" assumption. Secondly, depreciation is calculated on a "linear" basis on the original cost of the asset. Scrap values are ignored. Thirdly, he assumes that an average life-span of assets can be calculated. Furthermore, it is assumed that gross investment is growing at a cumulative rate and this is the propelling force of the system. Finally, the initial stock of assets is zero. On the assumption of one average life-span of assets the capital stock will be growing in

* I am grateful for help received from Dr. I. F. Pearce when working on this paper.

1. J. M. Keynes, *The General Theory of Employment, Interest and Money* (Macmillan, London, 1936), Chapter 8, Section IV, pp. 98-100.

2. E. D. Domar, "Depreciation, Replacement and Growth", *Economic Journal*, March, 1953, pp. 1-32; and R. Eisner, "Depreciation Allowances, Replacement Requirements and Growth, *American Economic Review*, December, 1952, pp. 820-831.

an initial period at a rate determined by annual gross investment as no replacement will be recorded. Eisner develops a similar type of model though he mentions also the possibilities of dropping the "one-hoss shay" assumption and allowing for accelerated depreciation.

The aim of the present paper is to develop the problem still further by relaxing assumptions about the pattern of replacement and depreciation. In this way we will see the situation set out in Domar's model as a limiting case and a better insight may be gained into the possible range of relationships between annual replacement and annual depreciation. The point will be made that should there be a large margin between the two aggregates, the relationship between capital and output will be distorted if net estimates alone are used. For example, if replacement is only eighty per cent of depreciation, capacity will have increased some twenty per cent more than net estimates would suggest. If the two aggregates do not correspond, the net capital stock, comprising the accumulation of past net investments, will not indicate correctly movements in the productive capacity of the economy. The alternative measure of productive capacity may be called the gross capital stock. This is calculated on the basis of annual gross investment less assets falling due for replacement. Statistical measurement of the gross capital stock entails an assumption about the life-span of assets as well as the "one-hoss shay" notion of full replacements only at retirement.

II

Before discussing the various alternative assumptions about the behaviour of replacement and depreciation, some matters of definition have to be settled. In the first place there can be confusion over the type of depreciation we are talking about as three separate notions can be identified. One is the measure of the reduction in the remaining services which can be extracted from an asset. Compared with this theoretical notion we have to consider the practical methods used to obtain an actual measure. Here it is possible to split the accounting figures into those authorized by government for taxation purposes and other measures developed by business for their own information. Theoretical depreciation is simply a concept while accounting notions of depreciation represent attempts at measurement. It is these latter categories with which we are more concerned when contrasting replacement and depreciation.

Doubts arise as to what is being measured when estimates of depreciation are prepared. It would seem that the usual estimates of depreciation whether prepared by business or for tax purposes incorporate obsolescence charges. They may simply reflect the desire to adjust depreciation allocations to the profitability of enterprise. Furthermore, depreciation estimates for tax purposes may reflect the vagaries of politics or the requirements of economic policy. Rates of depreciation may be determined partly by the need for encouraging particular types or the total of investment in the community. Such considerations were commonly applied in many countries during World

War II and the Korean episode; the Australian farm sector retains substantial advantages in this field.[3] Published figures, therefore, are subject to obvious and serious limitations.

We now turn to the ways in which the rigid assumptions of full replacement at retirement and linear depreciation over the full life of an asset can be relaxed. The depreciation item is the more easily amended of the two because of the greater availability of information about the actual methods adopted for depreciating assets than the timing of replacement.[4]

One simple change will be made to supplement the initial assumption made by Domar. Linear depreciation over a period shorter than the life-span of assets will be supposed. Suitably realistic assumptions regarding the timing of replacement are less easy to propose. As a first approximation it is assumed that replacement prior to the "correct" retirement date will be spread evenly over the period t-m to t where m is the average life-span of assets.[5] Although many alternatives are possible this replacement pattern offers some scope for testing the effects of relaxing Domar's rigid "one-hoss shay" assumption.[6]

The assumed methods of depreciation and replacement are not based solely on the two mentioned in the preceding paragraph. Thus, the annual depreciation sum is assumed to comprise two parts made up of a component based upon the Domar assumptions, i.e. linear depreciation, and another component based upon the alternative. Of the total annual depreciation a proportion (h) will represent the depreciation charged on a linear basis over the full life-span and historic cost of assets. The remainder ($1 - h$) will be the proportion where depreciation is computed in the alternative basis. The constant h has the property $0 \leqslant h \leqslant 1$.

The treatment of replacement is much the same as that set out above for depreciation. A proportion of the total annual replacement falling due is assumed to comprise two parts made up of one component (j) being replacement determined on the "one-hoss shay"

3. Accelerated depreciation confers a great advantage on the expanding firm. Such depreciation is a postponement of tax payments and, in effect, is a loan which need never be repaid so long as investment keeps on growing.

4. There is a voluminous literature in *Accounting Research*; for example, A. R. Prest, "Replacement Cost Depreciation", July, 1950; David Walker, "The Royal Commission and Depreciation Allowances", 1955; and T. A. Sanders, "Plant, Depreciation and 1949 Price Levels", 1949. United States sources are plentiful; see, for example, E. C. Brown, *Depreciation Adjustment for Price Changes*, Harward, 1952; George Terborgh, *Realistic Depreciation Policy*, Machinery and Allied Products Institute, Chicago, 1954; and, J. A. Findley, *Handling Higher Replacement Costs*, Studies in Business Policy, No. 47, National Industrial Conference Board, New York, 1950.

5. The alternative replacement pattern listed here is the same as that used by Eric Schiff, "A Note on Depreciation Replacement and Growth", *Review of Economics and Statistics*, February, 1954, pp. 47-56: he examines the effects of relaxing only the "one-hoss shay" assumption about investment.

6. George Terborgh, *The Bogey of Economic Maturity*, Machinery and Allied Products Institute, Chicago, 1945, pp. 108 ff. Terborgh provides the one other case in which an alternative pattern has been used. Here the assumed behaviour was that one half of all assets were replaced in equal instalments over the life of assets.

assumption. The proportion $(1 - j)$ will be replacement distributed over the life of assets as shown by the alternative version listed previously. As before (j) has the property $0 \leqslant j \leqslant 1$.

Before turning to the development of a model based upon the revised assumptions about replacement and depreciation, a recapitulation of Domar's system is necessary so as to deal with the element of total annual depreciation and replacement based upon the Domar assumptions, and to incorporate the effects of price changes upon the replacement cost of assets. After the completion of the initial time period between zero and m so that $t > m$, annual gross investment (G) expands at a constant rate (r) per year.

(1) $G = e^{rt}$

The rate of growth is shown by r and the rate of price rises by i. The gross capital stock (K) is equal to the accumulation of gross investment between t-m and t,

$$(2)\quad K_t = \int_{t-m}^{t} G\,dx = e^{rx}\,dx$$

$$= \frac{e^{rt}(1 - e^{-rm})}{r}$$

With linear depreciation, the annual depreciation sum (D) is equal to the gross capital stock divided by the average life-span of assets, i.e. K/m, so that

$$(3)\quad D_t = \frac{e^{rt}(1 - e^{-rm})}{rm}$$

The annual replacement (R) falling due at t is equal to gross investment m years earlier if we assume that all replacement is made at the retirement date m years after installation. If equation (1) is adjusted for price changes we have

(4) $R_t = G_{t-m}\ e^{im} = e^{r(t-m)}e^{im}$

Thus e^{im} expresses the constant rate of price increase over m years.

In our model only a proportion of the total annual depreciation and replacement is based upon the revised assumptions. The remainder comes from the original assumptions underlying (3) and (4) above. Thus, each of the two main aggregates have two components: $D_t = D'_t + D''_t$ and $R_t = R'_t + R''_t$. The weighting of each item is determined by either (h) or (j). By using the last two equations we have the first of the two components for both total annual replacement and total annual depreciation.

$$(5)\quad D'_t = \frac{(h)e^{rt}(1 - e^{-rm})}{rm}$$

and

(6) $R'_t = (j)\ e^{r(t-m)}e^{im}$.

We now turn to the revised assumptions. Each will be introduced separately and afterwards combined with one or other of the equations

shown in (5) and (6) to give a complete equation for the whole of total annual replacement or depreciation.

Alternative Depreciation Pattern

This is the case where linear depreciation is estimated over a period shorter than the average life-span (m) of the capital stock. In this case a constant (n) is a number between 0 and m, the period over which linear depreciation is computed being $m - n$. Therefore, $D''_t = (1-h)\ K/m - n$ and so we have

$$(7) \quad D''_t = \frac{(1-h)e^{rt}(1-e^{-rm})}{r(m-n)}$$

This is the alternative to the original assumption about depreciation. The revised assumption about the timing of replacement is more complex as the impact of price changes has also to be estimated. Once again we are dealing with only one part of total replacement, i.e. the component $(1-j)$.

Alternative Replacement Pattern

In this case replacement is distributed evenly over the average life-span of the capital stock from $t-m$ to t. We know that the amount of replacement to be distributed in this way is $(1-j)^{th}$ part of total replacement. Therefore, the amount to be replaced at t according to this assumption is $(1-j)/m$. If this latter proportion is related to gross investment between $t-m$ and t, and x is any time between them, we have

$$R''_t = \frac{(1-j)}{m}\int_0^m e^{r(t-m+x)}e^{i(m-x)}dx$$

where $e^{i(m-x)}$ represents the price rise recorded from the installation date to t. The equation on integration yields

$$(8) \quad R''_t = \frac{(1-j)\ e^{rt}(1-e^{-m(r-i)})}{m(r-i)}$$

Finally we combine the two components of total annual replacement and total annual depreciation. Once again we will look at the depreciation case first. From equation (5) and equation (7) we have

$$(9) \quad D_t = \frac{(h)e^{rt}(1-e^{-rm})}{rm} + \frac{(1-h)e^{rt}(1-e^{-rm})}{r(m-n)}$$

Total annual replacement is straightforward. We have a combination of equation (6) and equation (8).

$$(10) \quad R_t = \frac{(j)e^{r(t-m)}e^{im}m(r-i) + (1-j)e^{rt}(1-e^{-m(r-i)})}{m(r-i)}$$

III

Completion of this analysis makes it possible to turn to the central issue—the ratio of replacement to depreciation. The work involved here is a comparison of the equations for replacement in which account has been taken of price changes with the equations for depreciation which, because they are based upon historical cost, are

lacking a term for price changes. The values assigned to the various rates of growth of gross investment and prices and the average life-span of assets in the examples shown in this section are related to certain empirical findings for the United States economy. Although other values might be assigned to them on the basis of recent Australian experience, the models call for the use of data obtained for long periods of time to avoid the bias which can be brought into such estimates if calculations are based on relatively short periods. The main purpose of the exercise is to illustrate the implications of the amended ratio with certain combinations of figures.

We write down the ratio R_t/D_t derived from equations (9) and (10)

$$(11) \quad \frac{R_t}{D_t} = \left[\frac{r(m-n)}{(r-i)(1-e^{-rm})}\right] \left[\frac{(j)m(r-i)e^{m(1-r)} + (1-j)(1-e^{-m(r-i)})}{(h)(m-n) + (1-h)m}\right]$$

The effect of putting price changes into the model can now be seen. Whereas the implication of the simple model shown in the opening section was that prospects for growth of output would be enhanced by a higher rate of growth or a longer average life-span, the situation is now much more complex. Not only is the dominant role of the rate of growth suspect but also the importance of the average life-span. In the latter instance the longer-lived the asset, the greater is the possible difference between the original and replacement cost of assets. The overall rate of growth, r, is only one factor which must be considered along with the rate of growth of prices and the real rate of growth.

In Table I the results of testing equation (11) are shown. The examples presented do not cover all the possibilities as they are based upon the same real rate of growth of gross investment in all cases. Given the same relationship between the rate of price increase and the real rate of growth, an increased real rate of growth means a widening of the variations in the ratio of replacement to depreciation.[7] But the minimum ratio is reduced more than proportionately by

7. An example may help to clarify the point. In Table I in the example in the first column where m is 30 years and $m-n$ is 25 years, we have a real rate of growth of 3 per cent and a rate of price increase of 3 per cent. Suppose both rates are doubled so that the existing relationship between them is maintained; the ratios of replacement to depreciation will be as follows:

	$h=1{\cdot}0$ $h=1$	$1-h=1{\cdot}0$ $h=0$	$h=1{\cdot}0$ $1-h=1$	$1-h=1{\cdot}0$ $h=0$
	$m=30$ years		$m-n=25$ years	
	$r=6\%$	$i=3\%$	$r=12\%$	$i=6\%$
$j=1{\cdot}0$ / $1-j=0$	87·5	72·9	60·4	50·3
$1-j=1{\cdot}0$ / $j=0$	142·2	118·5	172·1	143·4

TABLE I

Ratios of Annual Replacement to Annual Depreciation with different patterns of depreciation and replacement behaviour
(%)

	$h=1{\cdot}0$ $1-h=0$	$1-h=1{\cdot}0$ $h=0$	$h=1{\cdot}0$ $1-h=0$	$1-h=1{\cdot}0$ $h=0$	$h=1{\cdot}0$ $1-h=0$	$1-h=1{\cdot}0$ $h=0$
	$r=6\%$ $i=3\%$		$r=5\%$ $i=2\%$		$r=7\%$ $i=4\%$	
	$m=30$ years			$m-n=25$ years		
1. $j=1{\cdot}0$ / $1-j=0$	87·5	72·9	78·3	65·3	97·1	80·9
1. $1-j=1{\cdot}0$ / $j=0$	142·2	118·5	127·3	106·1	157·8	131·5
	$m=40$ years			$m-n=35$ years		
2. $j=1{\cdot}0$ / $1-j=0$	79·5	69·6	69·7	61·0	89·8	78·6
2. $1-j=1{\cdot}0$ / $j=0$	153·7	134·5	134·7	117·9	173·6	151·9
	$m=40$ years			$m-n=30$ years		
3. $j=1{\cdot}0$ / $1-j=0$	79·5	59·6	69·7	52·3	89·8	67·3
3. $1-j=1{\cdot}0$ / $j=0$	153·7	115·3	134·7	101·0	173·6	130·2

Note: In this table the ratios of replacement to depreciation are shown only for the extreme values of h and j, *i.e.* where they are equal to zero or one. Internals between these extremes differ on the horizontal and vertical scales. In each subgroup the path between the limiting cases shown is exponential from left to right. The path from top to bottom in each subgroup is linear.

comparison with the maximum. Superimposed on this trend are the effects of changes in the rates of growth of prices and real investment, shifts in the average life-span of assets, and the reduced period over which depreciation is calculated. If the rate of growth of prices increases relatively to the real rate of growth, there is an overall rise in the ratio of replacement to depreciation. Given the same asset life and depreciation period, we find that ratios move proportionately from one situation to another; we see this by reading along the rows in Table I. The effect of an increase in the average life-span is a widening of the margin between the ratios without any general reduction. In fact, the pattern is the same as that for a relative increase in the real rate of growth mentioned in footnote 7. The effect of a shortening of the period over which assets can be depreciated, given no change in the average life-span of assets, is a reduction in the ratio of annual replacement to annual depreciation (except in the case where h is equal to one, i.e. where there are no write-offs over a period shorter than the average life-span). Examples of this effect are seen in changes from item 2 to item 3. Although reservations should be expressed about the generality of the alternative hypotheses describing replacement and depreciation, the various estimates dis-

closed in Table I give a surprising diversity to the measurement of this ratio. The value of applying these revised assumptions lies in the clear demonstration of the limited applicability of Domar's original model. His results are included in the more general equation (11) and are given in Table I where the parameters h — depreciation—and j — replacement—are equal to one. The ratios determined with the parameters at these values are not the maximum possible given any set of data. Acceptance of his rigid assumptions curtails severely any appreciation of the likely range of values.

As the evidence suggests a wide variation in the ratio of annual replacement to annual depreciation we can anticipate situations where the most modest price increase will reverse the ratio in favour of replacement; in short replacement falling due will exceed the annual provision for depreciation. It was thought that, in the United States at least, the long-run rate of price increases would be insufficient to eliminate the discrepancy between the two aggregates though the prospect was canvassed.[8] Instead we now have this as a distinct possibility. Yet a common practice amongst companies is the provision of general reserves in a time of inflation. As such reserves can be used to provide for replacement expenditures we can envisage this situation as the case where the depreciation system depends on the rate of price rise.

IV

Reservations about the general validity of the results in the preceding section can be expressed first on account of the effects of technical progress upon the replacement cost of assets and, secondly, because of the methods of assessing the value of depreciation funds set aside for the renewal of existing assets. The difficulties with handling technical progress stem from the failure of any measure of investment to show the rise in productivity when a new technique permits a higher output from an asset at the same time as its real cost remains the same. Design improvements of this type mean that the cost of replacing an asset may be overstated.

The effect of these design improvements upon the ratio of annual replacement to annual depreciation can be illustrated most readily by incorporating an additional item in the simple model based upon linear depreciation over the full life of the asset and the "one-hoss shay" assumption of full replacement at retirement; price changes can be ignored. Our expression for annual replacement is similar to equation (4), apart from the term for price changes,

$$(12) \quad R_t = G_{t-m} = e^{r(t-m)}$$

while annual depreciation is the same as equation (3)

$$(13) \quad D_t = \frac{e^{rt}(1 - e^{-rm})}{rm}$$

We will assume that design improvements are taking place at a constant rate λ so that the replacement equivalent ($\overline{R}$) of an asset

8. E. D. Domar, *op. cit.*, p. 11.

installed m years ago previously will be discounted by this amount. Thus equation (12) must be adjusted to

(14) $\overline{R}_t = e^{r(t-m)}e^{-\lambda m}$

Therefore we have two equations for the relation between annual replacement and annual depreciation. The first is the original model presented by Domar

(15) $$\frac{R_t}{D_t} = \frac{rm}{e^{rm}-1}$$

When the adjusted replacement equation $(\overline{R})$ is incorporated in the ratio we have a new and slightly modified expression

(16) $$\frac{\overline{R}_t}{D_t} = \frac{(rm)e^{-rm}e^{-\lambda m}}{1-e^{-rm}} = \frac{(rm)(e^{-\lambda m})}{e^{rm}-1}$$

In Table II the significant variations arising from the inclusion of the variable for technical progress can be seen. The estimates in column 1 are based upon Domar's original model (equation 15) while the other column includes an allowance for design improvements. A change in the rate of growth, such as a shift from group 1 to group 3, changes the overall level of the ratios but does not reflect the relative changes between the items in each group. A change in the average life-span has a marked impact upon the various ratios; an example being a shift from item 2 to item 1.

TABLE II

Comparison of Estimates of the Ratio of Annual Replacement to Annual Depreciation with allowances for technical progress

(%)

	$\frac{rm}{e^{rm}-1}$	$\frac{(rm)(e^{-\lambda m})}{e^{rm}-1}$		
	(1)	($\lambda = \cdot 25\%$) (2)	($\lambda = \cdot 75\%$) (3)	($\lambda = 1 \cdot 5\%$) (4)
1. $rm = 0 \cdot 5$, $r = 1 \cdot 25\%$, $m = 40$	77·08	69·74	57·10	42·30
2. $rm = 0 \cdot 5$, $r = 2 \cdot 5\%$, $m = 20$	77·08	73·25	66·34	57·10
3. $rm = 1 \cdot 0$, $r = 2 \cdot 5\%$, $m = 40$	58·20	52·66	43·11	31·94
4. $rm = 1 \cdot 0$, $r = 5 \cdot 0\%$, $m = 20$	58·20	55·31	50·09	43·11

Estimates of the funds available at any one time for the renewal of assets can be questioned should annual allowances not be spent immediately. If annual depreciation is allocated to reserves until replacement expenditures are required, these reserves become usually a part of the total capital employed in a firm. But firms do not appear to assess the profitability of using these depreciation reserves. Yet such a charge on a firm's earnings does seem justified since additional capital would have to be raised and rewarded if the depreciation reserves were

not available. Such a system would destroy the traditional link between the allocation of depreciation and the physical using-up of the services embodied in a capital asset. Yet, as we have noted at the beginning of Section II, actual estimates of depreciation are far removed from theoretical propositions. But, by assessing a profit on unused annual depreciation allowances, the financial aspect of accumulating depreciation charges in excess of immediate replacement requirements would be disclosed more fully than at present. In this way we would have an additional measure of the gains from accelerated depreciation.

Strictly this comment offends the spirit of our basic model which deals with flows rather than stocks of funds. Nevertheless, from the viewpoint of the individual firm, a discussion of the advantages of accumulating unused depreciation allowances has some merit. For the economy as a whole an argument solely in terms of flows is correct as the choice lies between the use of today's resources for replacement purposes or for new expenditures.

V

The very remote possibility of the ratio of annual replacement to annual depreciation being unity justifies some consideration of the usefulness of the gross capital stock as a measure of productive capacity. When contrasting gross and net estimates of the capital stock, we have to distinguish two levels of comparison. The first might be conceived on the plane of actual statistical analysis. The second is in the realm of theoretical speculation.

The treatment of the relationship between annual replacement and annual depreciation in preceding sections falls into the first category and refers mainly to the statistical calculations of the capital stock. The discrepancy between replacement and depreciation in this sense, suggests the usefulness of the gross capital stock as an index of productive capacity. However, the use of the gross measure is handicapped because actual estimates have to be made on the assumption of full replacement, at the assumed retirement date. Attemps to distribute replacement over the life-span of assets would be burdensome.

It is possible to assess the impact upon calculations of the gross capital stock if some replacement is carried out during the life of assets. We know from previous work that the gross capital stock can be expressed by the equation

$$(17) \quad K_t = \frac{e^{rt}(1 - e^{-rm})}{r}$$

But this equation is based upon the "one-hoss shay" assumption, namely, all replacement takes place at retirement. Suppose that this is not the case and that replacement is distributed evenly over the average life-span of the capital stock; this distribution formed the basis of the alternative replacement pattern shown in equation (8). Again long-run investigations of capital/output relationships make sense only if they are estimated on a constant price basis so that we

assume the effects of price changes have been eliminated prior to any statistical compilations.[9]

The amended expression for R_t, when replacement is distributed evenly over the average life-span of the capital stock, becomes

$$R_t = \frac{1}{m}\int_0^m e^{r(t-m+x)}dx$$

which yields on integration

$$(18)\quad R_t = \frac{e^{rt}(1-e^{-rm})}{rm}$$

This gives a formula for annual replacement at t. But, as we are concerned with the effects upon estimates of the gross capital stock when replacement is distributed over the life-span of assets, it is necessary to sum total annual replacement for m years—the assumed average life of the capital stock. Where $\underline{R}$ is the sum of all replacement for the years $t-m$ to t, we have

$$(19)\quad \underline{R} = \int_{t-m}^{t} \frac{e^{rx}(1-e^{-rm})}{rm}\,dx$$
$$= \left[\frac{1-e^{-rm}}{rm}\right]\cdot\left[\frac{e^{rt}(1-e^{-rm})}{r}\right]$$

We can now compare various computations of the gross capital stock under the two different assumptions about replacement. The limiting case is the gross capital stock based upon the "one-hoss shay" hypothesis; this is the estimate shown in equation (17). The formula we have derived on the assumption of some replacement being distributed over the life of assets will be deducted from (17). The gross capital stock now comprises the estimate in equation (17) less the sum of replacement during the life-time of assets—equation (19). Thus we have the adjusted gross capital stock ($\underline{K}$),

$$(20)\quad \underline{K} = \left[\frac{e^{rt}(1-e^{-rm})}{r}\right] - \left[\frac{1-e^{-rm}}{rm}\right]\left[\frac{e^{rt}(1-e^{-rm})}{r}\right]$$
$$= \frac{e^{rt}(1-e^{-rm})}{r}\left[1-\frac{1-e^{-rm}}{rm}\right]$$

As our interest is in the variations between the different methods of estimating the gross capital stock, the important element in equation (20) is the second factor because the first is based upon the original "one-hoss shay" assumption. Therefore, the second factor, which is always greater than zero but less than one for any positive value of rm, measures the percentage which the revised estimate bears to the original. The difference in which we are interested can be found

9. It should be apparent from the nature of the models developed by Domar and extended in this paper that, if price changes are eliminated, the ratio of annual replacement to annual depreciation will almost always be less than unity.

directly from the last term of the second factor. An example should clarify the point. If the value of the second factor is ·4 then the last term in this factor must be ·6. Accordingly, the revised estimate is 40 per cent of the original "one-hoss shay" estimate of the gross capital stock and so the margin between them is 60 per cent.

In Table III estimates of *rm* have been used for calculating the last term of the second factor in equation (20). The *rm* is a product of the real rate of growth of gross investment and the average life-span of assets so that marked differences in the behaviour of economies may not lead to much variation in estimates of the capital stock in this context. A rate of growth of 4 per cent combined with an asset life of 30 years gives the same result as a rate of growth of 3 per cent and an asset life of 40 years. One can see the large variations between the series even with estimates of *rm* which seem improbably large by the standards of western economies. Until more is known about the timing of replacement than at present, the use of gross capital stock

TABLE III

The Divergence between Estimates of the Gross Capital Stock with various assumptions about Replacement

(%)

rm	Margin between an estimate based upon "replacement at retirement" and the estimate assuming replacement during the lifetime of assets $\frac{1-e^{-rm}}{rm}$
0·5	78·7
0·8	68·8
0·9	65·9
1·0	63·2
1·1	60·6
1·2	57·6
1·3	56·0
1·4	53·8
1·5	51·8
1·6	49·9
1·7	48·1
1·8	46·4
1·9	44·8
2·0	43·2
3·0	31·7
4·0	24·5

Note: The percentage margins in the table show the difference between an estimate of the gross capital stock based on the "one-hoss shay" assumption and those where replacement is distributed over the lifetime of the asset. The formula from which these percentages are calculated is the last term in the second factor in equation (20). An example illustrates the method of calculation; with an *rm* of 1·0 the last term of the second factor is 0·632 giving 0·368 for the whole of the second factor. Thus an alternative measure of the gross capital stock is 36·8 per cent of an estimate based upon the "one-hoss shay" assumption. The margin between the series, comparing the latter with the former, is 63·2 per cent.

estimates, as a measure of productive capacity, might be seriously misleading.

Figures for the net capital stock provide an alternative measure. If only one method is used then spurious estimates of the connection between increments of capital and output might result. The most useful approach is clearly to use both the gross and net estimates of the capital stock.

When we shift to the theoretical plane, the distinction between replacement and depreciation is much less definite. On the one hand depreciation is intended to measure the decline in the physical services embodied in a capital asset while, on the other hand, replacement falling due is measured by the reduction in the output of capital equipment. It may well be argued that, for theoretical purposes, we are measuring the same thing whether it is called replacement or depreciation. A major possibility of a difference between the two items would arise if obsolescence were included as a part of depreciation.

VI

The first point emerging from the discussion is that far from annual depreciation charges exceeding annual replacement requirements, there is the clear possibility that, with even modest price rises, the relationship between these two items will be reversed. Nevertheless it is necessary to consider the effects of technical progress which may permit a greater real expenditure than was the case with the outlay on the original asset. Furthermore, if depreciation allowances are obtained in advance of replacement requirements, there is something to be said for accumulating the profits earned on such reserves so that the annual increment to depreciation funds would exceed annual allowances based solely on the original cost of assets.

The inference for much of the theorising on fluctuations and growth is that we cannot be clear about the marginal relations between capital and output for the economy as a whole. If the net estimates alone are used and annual depreciation exceeds annual replacement, output may rise much more than could be anticipated. There are good reasons for working with gross relationships in this field even though the "one-hoss shay" assumption weakens the applicability of the measure. As long as the details of actual business practice regarding depreciation allowances are imperfectly known and, in addition, reflect political and social desires, gross estimates seem the more reliable.

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INVENTORY ANALYSIS AND THE ECONOMICS OF FODDER CONSERVATION

Few economic decisions of practical import are made under conditions in which the relevant future is known with certainty. Invariably, elements of uncertainty are present. In consequence, the formulation of *ex ante* rules for optimal allocation of the decision maker's resources on an *ex post* basis is generally impossible. However, for some classes of decision problems, techniques have been developed by which efficient decisions, in terms of *ex ante* expectations, may be made. One such technique is that known as inventory analysis. The basic feature of this technique is the application of the procedures of mathematical probability to decision problems involving the concept of an inventory. Such problems occur frequently at all levels of the economy. For instance, what is the optimal reserve level of London Funds? Of Central Bank reserves? Of spare parts for an assembly line? Of migrants? Of guided missiles? All these are inventory problems; each involves a current decision aimed at meeting future contingencies.

As an example of the application of inventory analysis, we consider fodder conservation for drought relief. The role of drought as a determinant of instability in Australia's economy is sufficient justification for using this particular example.

1. *Fundamentals of Inventory Analysis*[1]

1.1. *Inventory.* Goods held or stored for the purpose of future sale or production constitute an inventory. The essential feature of an inventory is the interaction between present actions and future possibilities. As does any procedure for mitigating the effect of uncertainty, holding an inventory involves costs.

1.2. *Ordering cost.* The ordering cost of an inventory is the cost of obtaining the quantity of the commodity stored. This cost may be a production cost, a purchase cost (including transport costs) or both.

1.3. *Storage cost.* Costs are incurred in maintaining an inventory. These storage costs will generally relate to deterioration of the goods stored and to rental and depreciation costs associated with the storage facilities.

1.4. *Penalty cost.* If the inventory turns out to be inadequate, a penalty cost is incurred. The form in which this penalty is assessed depends on the circumstances of the problem. For example, in some situations the penalty may be measured in terms of foregone opportunities. In others, the correct penalty may be the increased cost of priority shipments to replenish the depleted inventory.

1. For a complete picture see Arrow, K. J., *et al., Studies in the Mathematical Theory of Inventory and Production.* Stanford University Press, 1958. For the role of inventory analysis in operations research see Churchman, C. W., *et al., Introduction to Operations Research.* John Wiley and Sons, Inc., New York, 1957. Pp. 3-19.

1.5. *Revenue.* The gross return received from use of the inventory is termed revenue. For instance, the revenue from a final good's inventory is the gross return received from the sale of items withdrawn from stock. In a manufacturing situation, the revenue from an input inventory is the value of the contribution of inventory withdrawals to final production. Again, as for penalty cost, how this contribution is assessed depends on the actual problem being studied.

1.6. *Salvage revenue.* If any of the inventory remains unused at the end of the production period, it may be sold; giving rise to a salvage revenue. The sale may be made on the market or the firm may "sell" the excess to itself for inventory use in the next production period. Of course, it may be that the unused inventory has deteriorated to such an extent that it is worthless.

1.7. *Demand.* Inventories are held to satisfy a demand in the future. If this demand is known the problem is termed deterministic. If the demand is unknown there are two possibilities. Either absolute uncertainty prevails or there is a probability distribution associated with the demand. If a frequency density function is available, expected demand under various circumstances can be calculated. If not, decision criteria for decision problems under absolute uncertainty have to be used.[2] Such cases will not be considered here.

1.8. *Static and dynamic models.* If the probability distribution of demand is constant from period to period a dynamic analysis may be carried out, solving the problem for all future periods at one shot. In such an appraisal salvage revenue only has to be made explicit for the last period considered. For intermediate periods, unused stocks of one period are accounted for as initial stocks of the next period. However, when a dynamic model is used, complications are caused by the necessity for discount factors and long range price estimates. It may be easier to use a static model, period by period. This has to be done if the probability distribution of demand changes over time.

2. *Static Inventory Model*

2.1. *Formulation.* By combining the costs and revenues outlined above, the profit or loss from a given inventory investment can be calculated for a deterministic situation. If only the probability distribution of demand is known the expected profit or its converse, expected loss, can be ascertained. Thus *expected loss* is the ordering cost plus expected holding cost plus expected penalty cost minus expected revenue minus expected salvage revenue. The problem is to determine the inventory order which minimizes the expected loss. In other words, given some existing inventory level at the commencement of the production period, how much of the commodity should be added so that the expected marginal cost is equal to the expected marginal revenue?

This static problem may be formulated as follows, assuming all

2. See Luce, R. D., and Raiffa, H. *Games and Decisions.* John Wiley and Sons, Inc., New York, 1957. Pp. 278-286.

costs are functions of inventory size at the time they are evaluated.[3] If

$L(y,x)$: expected loss when x is the initial stock and y is the total stock after ordering, assuming no lag between ordering and delivery; $y \geqslant 0$, $x \geqslant 0$;
ξ : quantity demanded from inventory during the coming production period;
$\phi(\xi)$: known frequency density function of ξ;
$c(y-x)$: ordering cost function of additional inventory;
$h(y-\xi)$: holding cost function, evaluated at end of period if $y > \xi$;
$p(\xi-y)$: penalty cost function, evaluated at end of period if $\xi > y$;
$v(y-\xi)$: salvage revenue function, evaluated at end of period if $y > \xi$;
r : revenue per unit of inventory withdrawal;
y^* : optimal inventory level;

then, assuming $\phi(\xi)$ is continuous,

$$(1)\quad L(y,x) = c(y-x) + \int_0^y \left[h(y-\xi) - v(y-\xi) - r\xi\right]\phi(\xi)\,d\xi + \int_y^\infty \left[p(\xi-y) - ry\right]\phi(\xi)\,d\xi.$$

The optimal inventory level, y^*, for a given x is found by minimizing the expected loss with respect to y. Thus we set

$$(2)\qquad L'_y(y,x) = 0.$$

The value of y satisfying (2) such that

$$(3)\qquad L''_y(y,x) > 0$$

is y^*. If normal integration of (1) is impossible and facilities for an iterative procedure are unavailable, these functions must either be summed discretely over a suitable number of ξ values or be approximated by functions that can be integrated. Should it be difficult to solve (2), the required solution may be found graphically by plotting $L(y,x)$.

Should ξ be a discrete variable the integrals of (1) may be read as Stieltje's integrals or replaced by summation signs.

2.2. *Decision rule.* The decision rule at the start of the production period is:

If $y^* > x$, order $(y^* - x)$ units.
If $y^* \leqslant x$, do not order.

It may happen that (1) does not have a unique minimum.[4] If so there will be a set of minimum y values, denoted here as the set Y. Let y' be any member of this set of minimum y values. Using the symbol ϵ to mean "belonging to", the decision rule is then:

3. An explanation of the mathematics involved in the formulation may be found in Anderson, R. L., and Bancroft, T. A. *Statistical Theory in Research.* McGraw Hill Book Co., Inc., New York, 1952. Pp. 19-24 and 31-32.

4. For the conditions under which a unique minimum will arise see Arrow, *op. cit.* Pp. 112-118.

If $y' \leqslant x$ for every $y' \epsilon\ Y$, do not order.
If $y' > x$ for some $y' \epsilon\ Y$, order $(y^* - x)$ units where y^* is the smallest $y' > x$.

This decision rule assumes that only the minimum expected loss is considered in planning. It may be, as Tintner suggests, that such factors as the variance and skewness of the loss distribution might be relevant.[5] We pay no attention to them here.

3. *Inventory Models of Fodder Conservation*

3.1. *Problem.* We now proceed to analyse fodder conservation as an inventory problem. In doing this we follow up a suggestion from Campbell that droughts be analysed on the basis of what they are: periods of natural feed shortage whose length follows some stochastic process that may be approximated by a statistical frequency density function.[6] Our task is that of all production planning: to maximize expected net return over the production period, or as we shall do, to minimize expected net loss. The specific problem is to determine how much fodder should be ordered at the start of the production period so as to minimize expected losses due to drought during the production period. Two models of this fodder conservation problem are formulated.[7] Consideration is later given to the question of what should be done if the initial reserve proves inadequate. Additional subtleties could be introduced into the models but they would take us away from the realm of exposition.

3.2. *General assumptions.*

3.2.1. *Type of firm.* To simplify the exposition, the analysis is restricted to a firm producing a single product and using only a single type of fodder. Specifically, the setting is that of a wool producing firm in the pastoral zone. The situation where a number of product, fodder and other resource alternatives must be considered is discussed in section 6.

3.2.2. *Market situation.* The firm is assumed to have no control over input or output prices at any particular time during the production period.

3.2.3. *Production period.* Withdrawals from the fodder inventory may be sustained over a period equal in length to the longest drought that might be reasonably expected. It is therefore most convenient to consider the production period as being at least this long. Of course such a production period might encompass several income production periods. The analysis could be carried out on an income period basis but it would be rather complex. A compromise is made in the models presented. They are static but assume a fodder conservation basis

5. See Tintner, G., "A Contribution to the Non-Static Theory of Choice." *Quarterly Journal of Economics*, 56: 274-306, 1942.

6. Campbell, K. O., "The Challenge of Production Instability in Australian Agriculture." *Australian Journal of Agricultural Economics*, 2: 4-10, 1958.

7. The construction of inventory models is discussed by Churchman, *op cit.* Pp. 155-194.

for the production period. A static approach is justified because fodder is a variable input whose optimal level of use changes from planning period to planning period as other economic variables fluctuate.

3.2.4. *Drought.* Assuming a given stocking rate, a drought is defined as a period of natural feed shortage. It may be possible for more than one drought to occur in a production period. If such droughts are small in number and length they are not significant. Otherwise they may be regarded as a single continuous drought in so far as their effects are concerned. The probability distribution of drought length is assumed to be known. The only index of drought severity incorporated in the models is drought length.

3.2.5. *Inventory policy.* Fodder price rises during a drought and gradually falls to some normal level upon cessation of the drought. It is assumed that the inventory is restocked to its optimal level after each drought when fodder price has fallen to its normal level. Equivalently, the cessation of each drought is regarded as the start of the next production period.

3.2.6. *Resources.* To set up an inventory, capital and storage facilities are required. For simplicity it is assumed that they are not restricted within the range of conservation eventualities that might occur.[8]

3.2.7. *Initial fodder stocks.* Initial fodder stocks are taken as being zero. This simplification could easily be relaxed.

3.2.8. *Ordering lag.* It is assumed that there is no lag between ordering and arrival of the ordered stock of fodder. This assumption would not be difficult to relax. There would certainly be a significant lag if ordering implied that the firm itself was to produce the fodder. In such circumstances complications would also be introduced because the yield from such an order would be a stochastic variable.

3.2.9. *Level of feeding.* The rate at which sheep are fed during a drought is assumed to be the minimum amount required for maintenance.

3.3. *Model I.*

3.3.1. *Assumptions.* We assume that sheep deaths and sales due to drought may occur. Planning is on the assumption that additional fodder will not be bought once the initial fodder stock is exhausted. All sheep will then die or be sold. In the actual situation with initial stocks exhausted, more fodder may or may not be bought. What is done depends on the relevant marginal conditions at that time. Revenue is derived from dead sheep by selling dead wool. Sheep that die during the drought are replaced immediately at the end of the drought. This replacement expense is the penalty cost. It is assumed that there is no difference between the revenue obtained from the sale of a drought stricken sheep and the revenue from dead wool if the sheep were allowed to die. Hence all revenue may be assessed in terms of wool.

8. Procedures for handling such restrictions are to be found in Churchman, *op. cit.*, pp. 255-274.

To give generality, the analysis is made on a per sheep equivalent basis.

3.3.2. *Formulation.* We designate by

k_1 : non-drought unit price of fodder including transport cost;
k_2 : physical deterioration coefficient of fodder over the production period;
k_3 : wool production per fodder unit;
k_4 : live wool price per pound;
k_5 : dead wool price per pound;
k_6 : minimum fodder requirement per sheep equivalent per unit of time;
k_7 : non-drought price per sheep equivalent;
y : fodder ordered per sheep equivalent;
ξ : amount of fodder demanded per sheep equivalent during the coming production period;
$\phi(\xi)$: frequency density function of ξ;
T : length of the production period, assumed equal to the longest drought reasonably expected;
τ : total period of drought during the production period, $0 \leqslant \tau \leqslant T$;
$\phi(\tau)$: frequency density function of τ;
p_r : replacement cost per sheep equivalent at end of drought.

We replace $\phi(\xi)$ in (1) by $\phi(\tau)$, there being a simple relationship between them since

$$\xi = k_6 \tau. \tag{4}$$

Hence

$$\phi(\xi)d\xi = \phi(\tau)d\tau, \qquad 0 \leqslant \xi \leqslant k_6 T, \qquad 0 \leqslant \tau \leqslant T. \tag{5}$$

Because of sheep deaths during a drought, the end-of-drought supply schedule for flock replacements will be to the left of the pre-drought supply schedule. Concomitantly, the demand schedule for flock replacements will move to the right as firms seek to rebuild their flocks. These movements cause sheep replacement prices at drought's end to be higher than the normal non-drought price of sheep. Moreover, the longer the drought the greater will these shifts be and the higher will be the replacement price at drought's end. Hence we have:

$$p_r = f(\tau), \qquad p_r > k_7, \tag{6}$$

or

$$p_\tau = k_7 + g(\tau). \tag{7}$$

Assuming a linear relation between fodder input and wool output, the costs and revenues associated with given y and τ values can now be formulated as follows; remembering that revenue in this model is either all derived from live wool or all from dead wool. Hence, on a per sheep equivalent basis, we have:

ordering cost	:	$k_1 y$	
holding cost	:	$k_1 k_2 (y - k_6 \tau)$,	$y > \xi$
penalty cost	:	$k_7 + g(\tau)$,	$y < \xi$
salvage revenue	:	$k_1(1 - k_2)(y - k_6 \tau)$,	$y > \xi$
revenue	:	$k_3 k_5 y$,	$y < \xi$
		$k_3 k_4 k_6 \tau$,	$y > \xi$

The loss function to be minimized is:

$$(8)\quad L(y,x=0)=k_1y + \int_0^{y/k_6}\left[k_1k_2(y-k_6\tau)-k_1(1-k_2)(y-k_6\tau)-k_3k_4k_6\right]\phi(\tau)d\tau + \int_{y/k_6}^{T}\left[k_7+g(\tau)-k_3k_5y\right]\phi(\tau)d\tau.$$

The optimal order per sheep equivalent at the start of the production period is then y^* where y^* minimizes the loss function.

This model is unrealistic in that it does not explicitly incorporate any possibility of some sheep being sold before the initially ordered stock of fodder is exhausted. Such sales would tend to ensure that at least some sheep might be carried right through the drough despite the inadequacy of the initial fodder stock in terms of the total flock. The possibility of such sales could be encompassed in a number of ways. The simplest is to have a set of within drought decision rules. These are presented in section 5. An alternative approach that might be used as a basis for planning at the start of the production period is formulated as Model II.

3.4. *Model II.*

3.4.1. *Assumptions.* It is assumed that only some and not all sheep will die or be sold. In other respects there is no change from Model I. The analysis is again on a per sheep equivalent basis.

3.4.2. *Formulation.* The only new variable involved is

λ : expected fraction of a sheep equivalent that will be sold or let die, $0 \leqslant \lambda \leqslant 1$.

For a given y and τ, the fraction of a sheep equivalent that could be carried through a drought is $y/k_6\tau$. Hence the proportion that would be disposed of is $(1-y/k_6\tau)$. Thus, in terms of expectation,

$$(9)\quad \lambda=\int_0^T\left(1-\frac{y}{k_6\tau}\right)\phi(\tau)d\tau.$$

Salvage revenue, ordering and holding cost are the same as in Model I. For penalty cost and revenue, again assuming a linear production relation between fodder and wool, we have:

$$\text{penalty cost} : \left(1-\frac{y}{k_6\tau}\right)\left[k_7+g(\tau)\right], \qquad y<\xi$$

$$\text{revenue} : \begin{cases} k_3y\left[k_5\left(1-\dfrac{y}{k_6\tau}\right)+\dfrac{k_4y}{k_6\tau}\right], & y<\xi \\ k_3k_4k_6\tau, & y>\xi \end{cases}$$

The revenue term for the situation with $y<\xi$ incorporates both live and dead wool. The loss function to be minimized is then:

$$(10)\quad L(y,x=0)=k_1y + \int_0^{y/k_6}\left[k_1k_2(y-k_6\tau)-k_1(1-k_2)(y-k_6\tau)-k_3k_4k_6\tau\right]\phi(\tau)d\tau + \int_{y/k_6}^{T}\left\{\left(1-\frac{y}{k_6\tau}\right)\left[k_7+g(\tau)\right]-k_3y\left[k_5\left(1-\frac{y}{k_6\tau}\right)+\frac{k_4y}{k_6\tau}\right]\right\}\phi(\tau)d\tau.$$

The optimal order at the start of the production period is y^* where, as before, y^* minimizes the loss function. If original planning is on the basis of this model, there is no reason why, in an actual drought, a reassessment of the situation of the type outlined in section 5 should not be carried out.

4. *An Example*

4.1. *Problem.* Given the following data,[9] what initial inventory of oaten grain per sheep equivalent should a firm maintain in order to minimize expected drought losses?

(11) $T = 36$ months
(12) $\phi(\tau) = 1/18 - \tau/648, \quad 0 \leqslant \tau \leqslant 36$
(13) $k_1 =$ £0·4 per bu.
(14) $k_2 = 0{\cdot}1$
(15) $k_3 = 0{\cdot}85$ lb. per bu.
(16) $k_4 =$ £0·35
(17) $k_5 =$ £0·1
(18) $k_6 = 0{\cdot}75$ bu. per month
(19:i) $k_7 =$ £5
(19:ii) $k_7 =$ £3
(20) $g(\tau) = 0{\cdot}1\,\tau$.

4.2. *Solution.* The following expected loss functions are obtained for normal non-drought sheep equivalent prices of £5 and £3 respectively.

For Model I:

(21:i)
$$L(y,x=0) = 6{\cdot}2 - 0{\cdot}055370y - 0{\cdot}014653y^2 + 0{\cdot}000424y^3$$
(21:ii)
$$L(y,x=0) = 4{\cdot}2 + 0{\cdot}092778y - 0{\cdot}017397y^2 + 0{\cdot}000424y^3.$$

For Model II:

(22:i)
$$L(y,x=0) = 6{\cdot}2 - 1{\cdot}039013y - 0{\cdot}054631y^2 - 0{\cdot}000342y^3 + 0{\cdot}370370y \log y + 0{\cdot}015741y^2 \log y.$$
(22:ii)
$$L(y,x=0) = 4{\cdot}2 - 0{\cdot}550741y - 0{\cdot}051888y^2 - 0{\cdot}000342y^3 + 0{\cdot}222222y \log y + 0{\cdot}015741y^2 \log y.$$

Table 1 gives the y values, to a single decimal place, at which these functions attain their unique minimum values. These are the desired y^* values.

Obviously Model I is much more conservative than Model II. Of course this was to be expected; Model I containing the assumption that if the initial fodder inventory is too small then all sheep will die or be sold. An indication of the conservatism of Model I in the

9. The data are hypothetical but, it is hoped, not completely unrealistic. The values of k_5 and k_6 are in line with those given by Briggs, P. K., *et al.*, "Maintenance Rations for Merino Sheep", *Australian Journal of Agricultural Research*, 8: 76-79, 1957.

TABLE 1

Optimal Inventory Order, y^*, in bushels per sheep equivalent

p_r	Model I	Model II
£5	24·8	16·2
£3	24·4	14·9

given context is the fact that for the longest drought period possible, 36 months, 27 bushels of oats per sheep equivalent would guarantee that all sheep survive. It should be emphasized that the particular y^* values obtained have no generality—they are based on a hypothetical drought frequency density function.

5. *Within Drought Decision Rules*

5.1. *Problem.* Our inventory models have been formulated as *ex ante* guides for fodder conservation decisions. They are based on expectations and, as such, represent the best bets available, given their respective assumptions. However, it may be that y^* turns out to be an inadequate reserve of fodder. Our models say nothing of what should be done in such a circumstance beyond recognizing that it may be efficient to let sheep die at some stage. When y^* is exhausted, and theoretically even before then, a reassessment of the situation should be made. Why? Because additional information is now available. It is known that a drought has begun and its current length, t, is also known. This information can be incorporated in the model, making possible a better estimate of the total length of the drought. A decision can then be made as to whether more fodder should be bought or whether sheep should be sold or let die. The last two alternatives are still regarded as equivalent.

5.2. *Decision rules.* The decision procedure to be followed is the usual economic one:

> If the expected marginal cost of additional fodder is greater than the expected marginal revenue from such fodder, then sell sheep or let them die.
>
> If the expected marginal cost of additional fodder is less than the expected marginal revenue of fodder, then buy more fodder.

Which of these rules should be applied can be determined by reapplying the inventory analysis as given in (1), (2) and (3), taking account of the additional information that is available. The major part of this information is that a drought period of some length, t, has already occurred. How much longer can it be expected to last? This can be determined from the conditional frequency density function $\phi(\tau|t)$ which gives the probabilities of various total lengths of drought, τ, for given current lengths of drought, t. The conditional frequency density function can be determined from the following relation:

$$(23) \qquad \phi(\tau|t) = \frac{1}{\beta}\phi(\tau), \qquad 0 \leqslant t \leqslant \tau \leqslant T,$$

where

$$(24) \int_t^T \phi(\tau)d\tau = \beta, \qquad 0 \leqslant \beta \leqslant 1.$$

Hence, to determine what should be done, the original loss function, (8) or (10), should be re-evaluated using the conditional frequency density function $\phi(\tau|t)$ instead of $\phi(\tau)$, at the same time incorporating any new price information that may be available. If y^* turns out to be zero, it is an indication that expected marginal cost is greater than expected marginal revenue. If y^* is positive, then order $(y^* - x)$ if $y^* > x$.

6. *Concluding Comments*

A major limitation of the present exposition is that the firm has been assumed to have only a single product and a single inventory commodity. This, perhaps, is not too unrealistic for the situation examined. However, a firm will generally have many alternatives, both on the input and output sides. Where such alternatives exist, a partial budgeting approach of the type used in our models may not lead to optimal behaviour. Account has to be taken of the marginal conditions of the other alternatives. This could be done in an inventory loss function context by treating each of the alternatives as an inventory.[10] Alternatively, parametric programming procedures[11] or a modified form of programming taking account of risk[12] might be used.

Finally, in an expository presentation such as this it has been impossible to present all the ramifications of inventory analysis. It has many positive features we have not mentioned. Some negative features exist, too. The most pertinent one is probably the lack of suitably arranged data. However, there is no reason why such data cannot be obtained if the cost is deemed worthwhile. With a little ingenuity it should then be possible to answer questions of the type raised in our introduction.

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10. See Bellman, R., *Dynamic Programming*. Princeton University Press, New Jersey, 1957. Pp. 164-166.
11. See Tintner, G., "Stochastic Linear Programming with Applications to Agricultural Economics", *Second Symposium in Linear Programming*, Vol. 1. National Bureau of Standards, Washington, D.C., 1955. P. 197.
12. See Heady, E. O., and Candler, W., *Linear Programming Methods*. Iowa State College Press, 1958. Ch. 17.

PROBLEMS OF DUOPOLY AND THE THEORY OF GAMES

1. *Introduction*

Fourteen years have passed since von Neumann and Morgenstern produced their *Theory of Games and Economic Behaviour*. The manner of its reception then ranged from the enthusiastic ("Ten more such books and the progress of economics is assured", wrote Marschak) to the contemptuous. "Literary" economists regarded it as the *reductio ad absurdum* of mathematical economics, a flight from reality or a mountain that brought forth a mouse. The authors themselves, despite repeated protestations of humility, claimed that "it will then become apparent that . . . this theory of games of strategy is the proper instrument with which to develop a theory of economic behaviour". The majority of economists said nothing—often, it is feared, because their mathematical equipment was too primitive to give them anything to say.

One result has been that increasing numbers of "non-mathematical" economists have taken it seriously enough to attempt to master its technique. It has even been finding a niche in many conventional economics courses in our universities. But, paradoxically, as it has gained ground it has somewhat lost prestige because it has not wholly satisfied the pragmatic test. We are now prepared to let it state its case but we have not been very convinced with the case as stated. Much of its modern criticism comes not from its enemies but from its friends.

"Economic problems, and particularly the inter-actions of the economic objectives of diverse individuals, are enormously complex; one could hardly expect to reduce them to the level of parlour games, even theoretically."[1] Tintner is less emphatic, but perhaps in effect more damaging when he writes, "This new theory is not yet in a state which permits statistical verification"[2]—and then gives it no further place in his outline of what econometrics can contain.

It appeared from the first that games theory might be the awaited method of answering the sixty-four thousand dollar question—how to find solutions for oligopolistic or even duopolistic market situations. Although Allen speaks disparagingly of using "such a sledge-hammer merely to crack the nut of a duopoly problem"[3] it is through games theory that we can perhaps most clearly realize just what that nut is. Certainly the originators of "The Theory of Games" had duopoly in their minds. Their first paragraph refers to certain unsurmounted difficulties in duopoly and oligopoly, the structure of whose problems, "familiar to every student of economics, is in many respects quite different from the way in which they are conceived at the present

1. Dorfman, Samuelson and Solow, *Linear Programming and Economic Analysis* (McGraw Hill, 1958), p. 445.
2. Tintner, *Econometrics* (Wiley, 1952), p. 5.
3. Allen, *Mathematical Economics*, p. 494.

time''. And there are some who hold that even the sledge-hammer is not enough. Dorfman, Samuelson and Solow, in the work already quoted from, say[4] ''Definitely, games theory does not crack the nut of duopoly theory!'' If this is so, a new approach suggests itself. Instead of trying to find a solution for duopoly, one might try proving that in some particular sense no solution exists. After all, mathematics once found this change of approach useful in the problem of ''squaring the circle''.

There are various aspects of duopoly theory: product differentiation, price warfare, advertising warfare, and so on. It is proposed here merely to consider the aspect of advertisement; but it is thought that the essential characteristic of duopoly is sufficiently revealed in this, and the model used to show that characteristic could perhaps be equally developed in the other directions to point a similar moral.

2. *A Model of Duopolistic Advertising*

We can construct a model to illustrate advertising warfare between duopolists and its most significant features by postulating the following conditions, all seemingly quite feasible.

1. The two rivals begin (in the absence of advertising) with equal spheres of influence over their market, but (presumably as a result of some superiority in A's product) the benefits of advertising are one-third greater for A than for B.

2. Two media of advertising (say, radio and the press) are available to each, either separately or together, and there is a further gain by combining the two. If the advertising strategies in order are: (i) using radio and press, (ii) using radio alone, (iii) using the press alone, or (iv) not advertising, then the relative effectiveness of the first three is taken to be represented by the proportion 8: 4: 3.

3. Since advertising is directed not only to getting a larger share of a market but also to extending the size of the market, and since it seems reasonable to suppose that the degree of success in the first aim is likely to be proportional to success in the second, it will be assumed that for every gain within the existing market an amount equal to one quarter of that gain will be added from outside.

4. It will be necessary to postulate definite cost and selling conditions. It is assumed that the (homogeneous) product is sold at a price 5 and that this is not altered during the advertising campaign. Costs of production will be supposed to be decreasing; to simulate this, an average cost function of $2+\left(1-\frac{x}{100}\right)^2$—where x is the number of articles produced—will be assumed to apply to each rival. The cost of radio advertising will be taken to be 55 and the cost of advertisement through the press will be 50.

5. A final important assumption will be built into the model at a later stage; this is that collusion between the rivals may be permitted.

4. *Op. cit.*, p. 420.

That is to say, if one rival can bribe the other to adopt an inferior strategy (the bribe of course being at least large enough to cover any loss incurred), and thereby increase his own profits by more than the amount of the bribe, such a contract shall be valid. This is a reasonable assumption; when only two rivals are involved it is unlikely that agreements, tacit or otherwise, will not take place if mutual gain can result from them. It is hoped to show that the essential instability of duopoly is directly related to this fact.

We choose, conforming to the first two assumptions, the following matrix to give the percentage of the market that is met by A for all possible associations of A and B strategies:

A's Strategies	B's Strategies 1	2	3	4
1	58	70	73	82
2	42	54	57	66
3	38	50	53	62
4	26	38	41	50

Obviously, if we want a similar matrix for B's percentages, it can be obtained from this by taking each element of the transpose of this matrix from 100; i.e. $[B] = [100] - [A]'$. This is not required at the moment but will be used in subsequent stages of the construction.

If we could ignore the final three assumptions, the problem would present no difficulty. Market percentages would represent profits. A similar example has been examined elsewhere[5] and shown to be a simple two-person constant-sum game with a saddlepoint that indicates that A and B will both choose the first strategy, precipitating an advertising war that benefits the producer of the better article (and hence, presumably, the consumers). The admission of these other assumptions, however, changes all this.

First we allow for extension of the markets. We will now require a matrix for each rival, since the game has become a variable-sum game. In each matrix the difference between each unit of the top three rows and its corresponding unit in the bottom row is increased by 25 per cent (adjusting to get whole numbers). These matrices indicate sales by each rival under each combination of strategies to a representative market that in a given time period would demand 100 units of the commodity under conditions of no advertising. The matrices so obtained are as follows:

A's Sales per Unit Time

A's Strategies	*B's Strategies* 1	2	3	4
1	66	78	81	90
2	46	58	61	70
3	41	53	56	65
4	26	38	41	50

B's Sales per Unit Time

B's Strategies	*A's Strategies* 1	2	3	4
1	48	64	68	80
2	33	49	53	65
3	29	45	49	61
4	18	34	38	50

5. Dorfman, Samuelson and Solow, *op. cit.*, p. 422.

Now it is at this point that games theory begins to make its most important new contribution to the problem. To solve a variable-sum game we must postulate an additional player who passively sustains losses to balance the combined net gains of the contenders; this changes a two-person game into a three-person game. Now the fundamental difference between a two-person game and a multi-person game is that the second makes possible what is impossible in the first—profitable coalitions. By a compensation paid by one player to another for accepting an inferior strategy, a surplus may be created more than sufficient to cover this compensation; in other words, the introduction of assumption 3 may itself necessitate the introduction of assumption 5. At least the question must be asked if such compensation becomes possible.

Each player will prefer to advertise fully. Each player would also gain most if his rival could be persuaded to advertise not at all. If A stopped advertising his sales would fall by 40 and B's sales would only increase by 32; if B stopped advertising, his sales would fall by 30 and A's sales would only increase by 24. Hence in neither case will collusion be profitable to both parties, since the profit gain of one rival was not enough to provide compensation for the other. But the question had to be asked. With further assumptions a different answer can result, as will be shown.

It is now time to introduce the fourth assumption, the recognition of the part played by costs in the determination of profits. With a price of 5, with average production costs of $2 + \left(1 - \frac{x}{100}\right)^2$ and with advertising costs of 55 for radio and 50 for the press, the profit will be $x\left\{3 - \left(1 - \frac{x}{100}\right)^2\right\} - a$, where sales are x and where a is 105 for strategy 1, 55 for strategy 2, 50 for strategy 3, and 0 for strategy 4. This gives us the following net profit matrices for the two players:

A's Net Profit

A's Strategies \ B's Strategies	1	2	3	4
1	85	127	135	164
2	70	109	119	149
3	59	97	107	137
4	64	99	109	138

B's Net Profit

B's Strategies \ A's Strategies	1	2	3	4
1	26	79	92	132
2	29	79	92	132
3	22	71	84	124
4	42	87	99	138

It will now be seen that the cost of advertising has resulted in a new optimal solution to the game. For A, it is true, strategy 1 still dominates (although even here, press advertising alone is quite uneconomical, and only the cumulative effect of propaganda makes it worth while in association with radio). For B, on the other hand, the fourth strategy now dominates; that is, it does not pay B to advertise at all.

The assumption of collusion may now be considered. From A's point of view the solution already reached is the most satisfactory one. His best position on the table has been reached. On the other hand, B's best position could be attained only if he could persuade A also to stop advertising completely. This would mean a loss to A of 26; but it would result in an improvement in B's profit of 96. He could recoup A's loss and still be 70 better off.

This is not the only possible profitable agreement that could be made, but it is, in this example, the best. Even if A were persuaded only to forego one of the advertising media a surplus (after the payment of compensation) of 30 would be created. There would even be a surplus if B persuaded A not to advertise but used either the radio or the press (but not both) himself. Nevertheless, the greatest combined profit (in this particular case) is made when each agrees to give up all advertising.

Will such a contract be made? It is clear that we should expect it to be. If B pays A anything between 27 and 95 they will both be better off, and they can neither of them afford to turn this down. It is, however, a different matter to decide upon the terms of the contract; the problem has suddenly turned into one of bilateral monopoly, and its answer will depend only upon the relative skills in bargaining. It is likely that A will press for more than half of the surplus of 70 (or in other words, require a compensation payment of more than 61 out of B's increase in profit of 96). He will probably argue that he loses not only profit but also prestige; he is in any case the dominant competitor if the contract is not made. But the important thing is that there is no unique way actually to calculate what is "fair compensation"; we know the range from which it must be chosen but nothing more.

3. *The Conflict of Solutions*

This makes more explicit the view hitherto held by many that duopoly is not fully determinate in the way most other market systems are determinate. An indeterminate system is in general one not completely defined by the given conditions, with not enough equations to evaluate its terms. Duopoly is indeterminate in the sense that when collusion is possible the maximising principle may become ambiguous. What is an optimal position for the "group" need not be simultaneously optimal for the individuals. Moreover, maximising is now very complex; there is a different maximal position for each policy, and though theoretically there should be a maximum maximorum, if this lies beyond difficult multi-dimensional geometry it is surely unreal to assume that practical business men will be striving for it; they are far more likely to choose pragmatically what seems a good policy and be content with its particular optimum.

This means in effect the addition of some new postulate to make the system determinate; but the search among alternatives has not so far been very systematic, nor is it certain that the suggestions made

by the mathematicians are plausible ones. It may be useful here to notice briefly one or two of the suggestions.

The first and basic one is the Neumann model as already examined. It rests upon the assumption that utility is transferable and that, therefore, equilibrium is defined by maximum joint profit, brought about by a side-payment rather like the "compensation" of welfare economics. Unfortunately, this seems only to reintroduce indeterminacy by raising the problem of determining the size of the side-payment.

A second postulate is suggested by Shapley[6]: the condition that "each player, on his admission to the coalition, demands and is promised the amount by which his adherence contributed to the value of the coalition". In the constructed case this would apparently mean that if B persuaded A to join him and refrain from advertising, since the combined profits would rise from 206 to 276, B pays A 70 for refraining from advertisement and is still himself the gainer by 26. This result is plausible in the sense that the man with the greatest bargaining strength gets the lion's share; but it is quite arbitrary; some contracts could possibly be made in such terms, but the terms are not inevitable.

An even more ingenious alternative postulate has been offered by Nash,[7] amusingly reminiscent of the rugged individualism of early American capitalism. He suggests that the determination of the bribe of the side-payment can be made by equating it to the threat of blackmail. In simple words, the smallest sum B needs to pay A to persuade A to do what B wants is measured by the loss A will incur if B does what A does not want. Despite the confidence of uniqueness suggested by Nash, it appears, however, that the numerical value of the threat could feasibly be defined in different ways.

For example, in the case examined, the worst threat B could make is the threat to advertise fully. This would cost B 16 in reduced profit, but would lower A's profits by 26. Since both parties know that the threat is not a bluff, the blackmail payment from A to B need not be more than 16. But if the threat is accompanied by the bribe to persuade A not to advertise, this bribe must be at least large enough to give A finally what he would have had if the blackmail had been paid, that is, 164 — 16. Nash's postulate can thus be made to show that B's side-payment to A must be at least 10 in order to bring 138 up to this value. It will be noticed that the disposition of the present problem is such that the lower limit implied by the threat is below the Neumann range, but this need not always be the case.

4. *Conclusions*

The arguments examined here could be modified to apply to other aspects of duopoly beside advertising warfare, and indeed to general problems of oligopoly. The conclusion to be tentatively drawn could

6. "A Value for n-Person Games", in *Contributions to the Theory of Games* (Kuhn & Tucker, Princeton, 1953).
7. "Two-person Co-operative Games", in *Econometrics*, no. 21 (1953), p. 136.

be stated in the following way. In the presence of active collusion the maximising principle seems to be insufficient by itself; we need to add some further condition defined by the coalition contract. But here all that mathematics can do is to select a priori different possible conditions and build models therefrom, without showing that any particular condition is inevitable. If this is so, mathematics has gone far enough to show that mathematics alone can give no final solution. It seems likely that any particular coalition contract will name its own condition *ad hoc*. In this case, the most fruitful future study of oligopoly may be through case histories of actual coalitions to find the most realistic alternatives, and then to develop the mathematics appropriate to these.

This is no new view. It was stated a quarter of a century ago by Chamberlain in the following explicit way:[8]

"Duopoly is not one problem, but several. The solution varies, depending upon the conditions assumed. Putting aside the factor of uncertainty, it is (with minor exceptions) determinate for each set of assumptions made."

Games theory has given support to this view. It has perhaps cast some doubt on the existence of the minor exceptions, and it has offered useful techniques for a number of the alternative possible conditions. It appears very doubtful if it has done—or can do—much more.

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8. *Theory of Monopolistic Competition* (3rd ed.), pp. 53-4.

INTERNAL AND EXTERNAL BALANCE: THE ROLE OF PRICE AND EXPENDITURE EFFECTS

This paper[1] illustrates by means of variations on one simple diagram certain features of the relationship between internal and external balance. Its object is merely to indicate the intimate relationships between price and expenditure effects in reconciling full employment policy with balance of payments policy.

For the major part of the argument the terms of trade are assumed unaffected by domestic policies, such as devaluation or deflation. Secondary terms of trade effects caused by repercussions of domestic policies on other countries receive only brief consideration in the latter part of the paper.

This procedure may be justified on two grounds. The first is the simple methodological argument for breaking up a complex problem into its component parts. The second is more practical. Whatever may be the case in economies playing a major role in world trade, in a dependent economy such as Australia no great damage is done if secondary terms of trade effects are neglected. Variations in the terms of trade—although frequent and often disastrous—are determined almost exclusively by conditions abroad; while the effects of Australian policies on the terms of trade are generally thought to be small.[2] Therefore there is a case for treating the terms of trade as given—a fact to which we in Australia must adjust our policies—and taking full advantage of the very considerable simplications this allows in the analysis of our international trading problems.[3]

I

Divide total production and total expenditure into two categories: traded goods and non-traded goods. This distinction corresponds broadly to sheltered and unsheltered industries. Traded goods are those with prices determined on world markets. They consist of exportables, of which the surplus over home consumption is exported; and importables, of which the deficiency between consumption and home production is imported. Non-traded goods are those which do not enter into world trade; their prices are determined solely by internal costs and demand. It is assumed, quite unrealistically, that these two categories do not shade into each other.

The procedure of treating exportables and importables as a single class of good (traded goods) is quite legitimate so long as the terms of trade are unaffected by events inside Australia.[4] The reason is that

1. This paper owes much to T. W. Swan's "Longer Run Problems of the Balance of Payments" (A.N.Z.A.A.S. paper 1955). I am also indebted to W. M. Corden for valuable advice.

2. See J. E. Meade: "The Price Mechanism and the Australian Balance of Payments", *Economic Record*, No. 63 (November 1956), p. 248.

3. The proposition that changes in the terms of trade play a minor role in restoring balance of payments equilibrium has been argued *generally* by I. F. Pearce in a paper shortly to be published.

4. The formal assumption is a perfectly elastic world demand for exports, and a perfectly elastic world supply of imports.

any quantity of exportables may be exchanged for importables at the relative price determined by the given terms of trade. Therefore, since trade allows exportables to be transformed into importables, and vice versa, it is a matter of indifference so fas as the balance of payments is concerned whether an increased production of traded goods is achieved by means of greater production of exportables or greater home production of importables.

From a different viewpoint, the device of treating exportables and importables as a single class of good is equivalent to regarding the home production of both as being sold on the world markets for foreign exchange (tariffs becoming export subsidies), and then using this foreign exchange to buy back the importables we have sold, the part of our exportables we wish to consume, and imports from other countries. In other words, home produced importables are treated as a special class of exportables: goods which could be sold on world markets, but in fact are not, for we should only have to buy them back.[5]

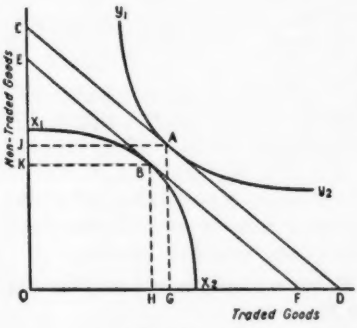

FIG. 1a

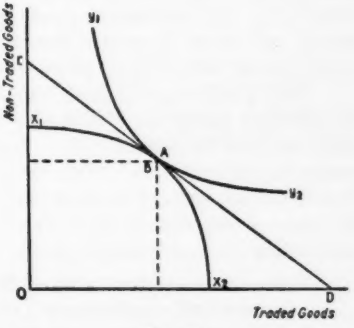

FIG. 1b

In Figure 1a the quantity[6] of traded goods is measured on the horizontal axis; and the quantity of non-traded goods on the vertical axis. The line CD represents total expenditure. OD is the amount of traded goods which could be purchased with this expenditure, given their prices; and OC is the amount of non-traded goods which could be purchased, given their prices. The slope of CD, therefore, represents the relative price of non-traded goods compared to traded goods. It corresponds broadly to an index of domestic prices compared to

5. This procedure effectively "collapses" the three-dimensional transformation function relating exportables, importables, and non-traded goods into a two-dimensional function. The assumption of constant terms of trade means that the three-dimensional function *after trade* contains a straight line in the plane relating importables and exportables—i.e. any combination of exportables and importables can be transformed into any other combination by trade. It is the existence of this straight line—which stems from our special assumption—that makes possible the reduction to two dimensions.

6. For a precise measure of quantity it is easiest to think of traded goods as measured in units of either importables or exportables, the one being translated into the other at the given terms of trade.

world prices. The indifference curve y_1y_2 represents consumers' preferences between traded and non-traded goods. The point of tangency, A, indicates the goods which will be demanded, given the level of expenditure and relative prices represented by CD.

So much for the demand side. On the supply side, x_1x_2 is the transformation curve which traces out all possible combinations of traded and non-traded goods which may be produced, given home factor supplies, technical knowledge, natural resources, etc.[7] EF is that special level of expenditure equal to full-employment production, given home and overseas prices. The slope of EF (subsequently known as the income line) is again determined by the relative prices of traded and non-traded goods. The point B represents the most profitable proportions for producing each type of good at these relative prices (marginal costs proportional to relative prices).

The situation portrayed in the diagram is one of external and internal disequilibrium. At the given level of expenditure and relative prices the community wishes to consume OG traded goods but produces only OH. There is consequently a balance of payments deficit.[8] Internally, OJ non-traded goods are demanded but only OK are produced and there is excess demand at home—a situation of overfull employment and a rising price level.

This particular diagram portrays only one of many possible disequilibrium positions. Depending upon the positions of A and B, the diagram may be generalized to trace Professor Swan's "four zones of economic unhappiness".[9] In general, if A is to the right of B, the situation is one of current account balance of payments deficit; and to the left, one of surplus. If A is above B there is home over-employment; and below B, under-employment. There are thus four zones—

A above and to the right of B: Balance of payments surplus and over-full employment (zone I).

A below and to the right of B: Balance of payment surplus and under-employment (zone II).

A above and to the left of B: Balance of payments deficit and over-full employment (zone III).

A below and to the left of B: Balance of payments deficit and under-employment (zone IV).

It is important to note that all such positions are ex ante disequilibrium positions in which the economy is always in the process

7. The given terms of trade are an element determining the shape and position of both the transformation and indifference curve. In the transformation curve they partly determine the proportions in which resources devoted to traded goods are used to produce importables and exportables, as well as the terms on which exportables may be transformed by trade into importables (or vice versa). Similarly, in the indifference curve they partly determine the ratio at which exportables and importables are translated into the combination appropriate to consumers' tastes at each point on the curve. The question is considered further in Section III below.

8. Balance of payments deficit = exports — imports = production less home consumption of exportables — consumption less home production of importables = production of importables plus exportables — consumption of importables plus exportables = production minus consumption of traded goods.

9. T. W. Swan, *op. cit.*, p. 3.

of movement: overseas reserves are either increasing or decreasing; there is a rising or falling domestic price level; and either over- or under-full employment. Only when A coincides with B is there a stable equilibrium where both internal and external balance is achieved. Figure 1b portrays such an equilibrium. At the "kissing-tangency point", where A and B coincide, the following conditions are realized: (i) expenditure coincides with full-employment income; (ii) the demand for traded goods equals production (i.e. external balance); (iii) the demand for non-traded goods equals production (i.e. internal balance); and the marginal rate of production substitution equals the marginal rate of consumers' substitution (marginal costs equal to selling price in each sector).

Such an equilibrium is a rare and delicate creature. The following section examines three common means by which a situation of internal and external equilibrium may be turned into one of disequilibrium: excess demand, a rise in world prices, and overseas capital inflow.

II

(a) *Excess demand*

Figure 2a traces out the internal and external consequences of excess demand. In the diagram the excess demand is represented by the expenditure line CD in excess of the income line EF. A is above and to the right of B—a situation of home over-employment and a balance of payments deficit.

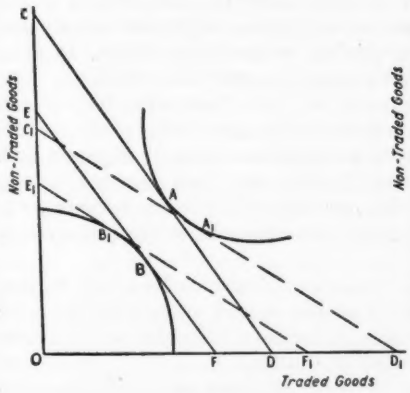

FIG. 2a

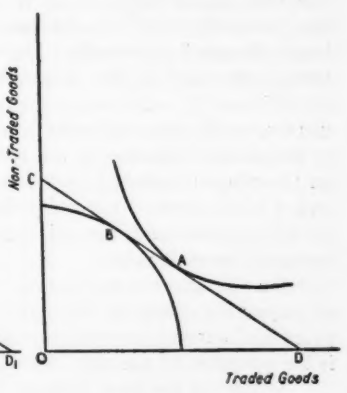

FIG. 2b

This is the first stage of excess demand where external and internal imbalance is caused wholly by expenditure effects. If this situation persists, the second stage begins as price effects come into operation. Internal excess demand raises home costs and prices, so increasing the price of non-traded goods relative to traded goods. In the diagram this is represented by the broken income and expenditure lines, E_1F_1 and

C_1D_1, which have a lesser slope compared to EF and CD. The demand and supply reactions to these second-stage price changes are as follows. On the supply side, increased prices of non-traded goods lead to an increase in their production at the expense of traded goods—a movement of resources away from production of exportables and importables to home goods. This is represented on the diagram by the movement to the left around the transformation curve from B to B_1 as EF becomes E_1F_1. The extent of this supply reaction depends upon the elasticity of substitution between traded and non-traded goods, represented by the curvature of the transformation curve.

On the demand side, the higher price of non-traded goods reduces demand for non-traded goods and adds to the demand for traded goods—a movement to the right around the indifference curve from A to A_1. Again the strength of this reaction depends upon the elasticity of demand substitution, represented by the curvature of the indifference curve.[10]

The upshot of these second-stage price effects is that production of non-traded goods increases as the demand for them declines; while the production of traded goods falls as demand increases. It is apparent, then, that after the second-stage price effects have come into operation there is no necessary reason why the original excess demand should continue to cause domestic over-employment, i.e. in terms of the diagram that A_1 should be above B_1. It is quite possible for the original excess demand to be wholly transferred via these price effects on to the balance of payments, leaving the economy in a state of internal balance (or even under-employment if A_1 falls below B_1). The reason is that the price effects of dearer non-traded goods—a greater supply and lesser demand—may offset the original expenditure effects. In other words, the part of the original excess demand which falls on home goods is met by an increasing supply and lesser demand as they become dearer, until eventually the whole excess demand falls on the balance of payments. Whether or not such a situation will occur depends, first, on the relevant elasticities—a combination of a high supply elasticity and a high demand elasticity for non-traded goods are favourable to its emergence—and, second, on the time allowed for the price effects to work themselves out.

On the other hand, excess demand must always lead to a balance of payments deficit in both the first and second stages; for here the price and expenditure effects work in the same direction so that there is no question of the one offsetting the other.

Whatever the final form of the disequilibrium, two steps are necessary to restore simultaneous internal and external balance. The first is to restore equality between expenditure and full employment equili-

10. Note that the case considered is one of "real" excess demand. The case of money excess demand may be considered by drawing the line C_1D_1 so that D and D_1 coincide—i.e. after the rise in prices of non-traded goods, fewer can be purchased with the same money expenditure. The consequent fall in real spending is reflected in the lower indifference curve tangential to this expenditure line. The monetary case differs from the real case only in that part of the original over-spending is eliminated parallel with second-stage price changes.

brium. This is the "absorption"[11] part of the problem. But this step alone is insufficient to restore equilibrium once the second-stage price effects have come into operation. An attempt to eliminate the balance of payments deficit by reducing expenditures will lead to domestic unemployment; while the maintenance of full employment involves a balance of payments deficit. This is illustrated by Figure 2b.

In Figure 2b expenditure equals full employment income. Even so the balance of payments is in deficit and there is home unemployment as the demand for non-traded goods falls short of production. The economy is still in disequilibrium because the proportions in which it is profitable to produce traded and non-traded goods do not match the proportions in which they are demanded. The only remedy is a change in relative prices such that home costs and prices fall relative to overseas costs and prices—i.e. the line CD must become steeper. A free economy could achieve this price adjustment by either one, or both, of two means:

(a) By internal deflation, which, by reducing money wages and other factor prices, lowers the prices of non-traded goods relative to traded goods. The production of non-traded goods is discouraged and the demand increased; while the production of traded goods is encouraged and the demand decreased. Eventually full equilibrium would be achieved (although total real expenditure would almost certainly fall below full employment levels in the process of this painful cost and price adjustment).

(b) If the exchange rate is free, the demand for foreign exchange exceeds supply, and the rate would fall. The prices of non-traded goods would fall relative to traded goods, and by a process similar to (a) internal and external balance would be achieved.[12]

A directed economy faces a similar choice: devaluation or deflation. But, whatever the method, home prices and costs must fall relative to overseas prices and costs before full employment can be reconciled with balance of payment equilibrium.

Further, as these changes in relative prices take place, additional cuts in expenditure are necessary to achieve the "kissing-tangency point" which denotes full equilibrium. For, at the new set of relative prices the expenditure line will exceed the income line. This reaction, in particular, emphasizes the intimate relation between expenditure and price effects in reconciling internal and external balance.

(b) *A rise in overseas prices*

This case, the converse of (a), is portrayed in Figure 3a. Increased overseas prices lead to higher prices of traded goods relative to non-

11. See S. S. Alexander: "Effects of Devaluation on a Trade Balance", *I.M.F. Staff Papers*, Vol. II (1951-2), pp. 263-78.

12. In the situation considered there is no question that a devaluation will not be effective; for one of the relevant elasticities—the world demand for exports—has been assumed infinite. See Meade: *The Theory of International Economic Policy*, Vol. 1, pp. 65-73.

traded goods; in the diagram this is represented by the greater slope of CD_1 and E_1F_1 compared to the original price ratio CD. In the first stage, the reactions are as follows. On the supply side, the higher relative price of traded goods tends to increase production at the expense of non-traded goods—a movement around the transformation curve from B to B_1. The demand price effects similarly lead to a movement to the left around the indifference curve as non-traded goods are substituted for traded goods. The expenditure effects depend upon the behaviour of domestic incomes. In the first stage when the level of

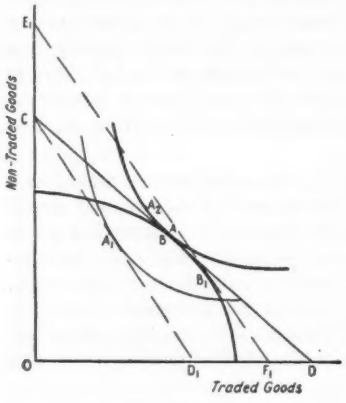

FIG. 3a

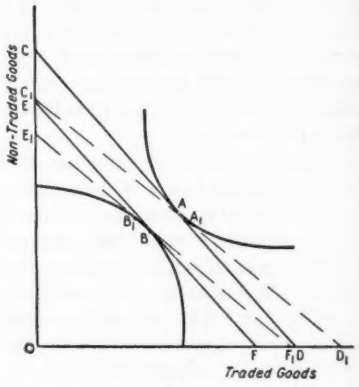

FIG. 3b

money expenditure is unchanged, the expenditure line is represented by CD_1, i.e. after the rise in overseas prices the same level of money expenditure will purchase only OD_1 traded goods. The fall in real expenditure is represented by the shift to a lower indifference curve.

It is interesting to note that at this first stage A_1 could fall below B_1. This implies that simply to maintain an unchanged level of money expenditure may lead to home unemployment. This is because the expenditure effects on the demand for non-traded goods of a reduced real expenditure could more than offset the price effects as they became relatively cheaper. In other words, if the demand elasticities are greater than unity dearer importables and exportables may lead to increased expenditure on such goods, so reducing the expenditure available to purchase home goods. The implication is that maintenance of domestic balance in the face of a rise in world prices requires a rather more sophisticated policy than simply holding the line with respect to expenditure. Depending on the relative strength of the income and price effects, money expenditure may need to increase or decrease simply to maintain home employment.

The second stage begins as money incomes rise under the stimulus of increased export earnings and higher import prices. A_1 tends to move upwards and to the right. Consider the case where money incomes rise sufficiently to sustain the original level of real expenditure, i.e.

A_1 moves to A_2, the point on the original indifference curve tangential to a line parallel to CD_1. A_2 is above and to the left of B_1, a situation of domestic over-employment and balance of payments surplus. The balance of payments surplus is less than at stage one, but only because of increased expenditure which has also caused domestic over-spending and over-employment. Again the problem is that home costs and prices relative to world costs and prices make internal and external balance irreconcilable.

The situation could be rectified simply by allowing the domestic over-employment to work itself out in increased prices for non-traded goods. (Stage three.) Provided the process can be halted, the original price ratio, CD, will be restored. Coupled with adjustments to the level of money expenditure, A_2 and B_1 will converge until the original position of full equilibrium is restored.

At any point, the alternative of exchange appreciation could be invoked to short-circuit the whole process. At stage one, exchange appreciation alone would be sufficient to counteract the increased prices of traded goods. At stage two the appreciation would need to be coupled with measures to reduce money expenditures to their original level. At stage three the extent of the appreciation would need to be less than the rise in prices of traded goods in proportion to the stage three increases in domestic prices which had taken place; also a reduction in money expenditure is required.

(c) *Overseas capital inflow*

Figure 3b illustrates the effects of overseas capital inflow. This makes possible and desirable a current account balance of payments deficit. However, if expenditure is increased above the full employment income line EF to CD, domestic over-employment will result—A will fall above B—since at the current ratio between prices of non-traded and traded goods, a part of the extra expenditure will fall on non-traded goods. (Or, from a different viewpoint, overseas investment involves a component spent locally—on buildings, for example—which creates additional demand for non-traded goods.) If internal balance is to be maintained, structural changes are needed to transfer this additional domestic spending on to imports. Either one of two policies may be followed: the first is exchange appreciation; the second to allow domestic prices to increase. In either case the increased relative price of non-traded goods raises the demand for traded goods at the expense of non-traded goods—a movement from A to A_1—and increases production of non-traded goods relative to traded goods—a movement from B to B_1. These structural changes perform the desired task of transferring the whole of the extra expenditure on to the balance of payments, so enabling domestic balance to be reconciled with capital inflow.

III

The next step is to consider the effects of a change in the terms of trade, in the first instance an exogenous change originating overseas. For such analysis care is needed in the measurement of traded

goods; in the following the convention has been adopted of measuring the quantity of traded goods in terms of units of importables, exportables being translated into importables at the ruling terms of trade.

In Figure 4a the unbroken transformation and indifference curves are tangential to CD and in contact, so that the economy is in a position of simultaneous internal and external balance. The terms of trade are parameters determining the shape and position of these curves, and the first step is to ask how they will respond to, say, an "adverse" movement of the terms of trade caused by a fall in the price of exportables.

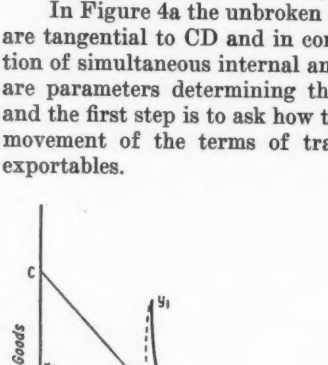

FIG. 4a

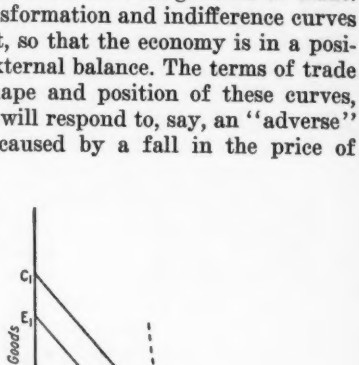

FIG. 4b

Consider first the transformation curve. At a given point on the curve certain resources are devoted to the production of traded goods. An adverse movement of the terms of trade implies that the exportables produced by these resources exchange in trade for fewer importables. Consequently the overall quantity of traded goods (measured in units of importables) produced by these resources declines, and the curve moves to the left. Two further considerations are relevant in determining this leftward movement. First, the extent is influenced by the proportions of traded and non-traded goods: greatest when all resources are devoted to traded goods; and zero when all resources are devoted to non-traded goods. Second, the movement will be partially offset by the reallocation of traded goods resources away from exportables towards home production of importables. This internal substitution within the category of traded goods, however, can only be a partial offset; for to produce importables in place of exportables implies that the comparative advantages of exportables are forgone.

The upshot is that an adverse movement of the terms of trade causes a contraction of the transformation curve to an extent determined by: (a) the extent of the adverse movement; (b) the elasticity of production substitution between importables and exportables; and (c) the proportions in which resources are devoted to traded and non-

traded goods. In the diagram the new transformation curve is represented by the broken curve x_1x_3. This shift from x_1x_2 to x_1x_3 may be termed "the producers' terms of trade effect".

Similar considerations apply to the indifference curve. At a given point on the curve, fewer traded goods (measured in terms of importables) are needed to maintain the same level of "consumers' satisfaction"; for the exportables consumers require represent fewer importables. The indifference curve therefore also moves to the left. Again the extent of the shift is modified by consumers' substitution of exportables for importables, and is greater the higher the proportion of traded goods consumed. This shift, represented by the broken curve, y_1y_3, will be termed the "consumers' terms of trade effect".

Shifts in the transformation and indifference curves caused by the adverse movement of the terms of trade reflect the interest of producers and consumers respectively. For the economy as a whole, the national, or net, terms of trade effect is reflected in the gap between the new curves. As may be expected it can be shown that an adverse movement normally leads to such a gap and consequently that the national terms of trade effect is normally disadvantageous. The reason is simply that for a country engaging in international trade the importance of exportables in production is greater than in consumption. Thus the leftward shift in the transformation curve is greater than the leftward shift in the indifference curve.[13] In other words, the position is analogous to that of a producer who spends a part of his income on his own product. When the relative price of his product falls his loss qua producer outweighs his gain qua consumer.

Before leaving these shifts, it should be noted that if traded goods were measured in units of exportables, the curves would shift to the right, and the movement of the indifference curve would be more extensive than the movement of the transformation curve. However, the gap would remain, leaving the national terms of trade effect unchanged. This different behaviour is of no consequence. It is simply a reflection of the index-number problems which abound in this part of the analysis. It does, however, point to the care needed in making statements about real income and real expenditure in this context. (An adverse movement of the terms of trade causes the national income to fall when measured in terms of importables and to rise when measured in terms of exportables.)

From Figure 4a it is apparent that two steps are necessary to restore simultaneous internal and external balance. The first is a cut in expenditure equal to the national terms of trade effect. The second is a change in the relative prices of traded and non-traded goods consistent with the new point of tangency. There can be no certainty as to direction of the necessary adjustment; it depends in part on the shifts in the curves as they reflect demand and production substitution

13. There is the possibility of freak cases where the consumers' terms of trade effect outweighs the producers' effect. This would be a possibility where importables could easily be substituted for exportables on the production side, so that the producers' terms of trade effect was small.

between importables and exportables. However, when the terms of trade decline via a fall in export prices there is a relative presumption in favour of devaluation rather than appreciation. This is because the consumers' terms of trade effect encourages a shift of expenditure towards traded goods (since exportables are cheaper); while the producers' terms of trade effect encourages a movement away from the production of traded goods. From another viewpoint, a fall in export prices reduces the overall price of traded goods relative to non-traded goods; and this implies that the necessary price adjustment is rather more likely to be in the direction of devaluation than appreciation. This case is illustrated in Figure 4b. The broken curves are those of Figure 4a after the adverse movement of the terms of trade, and the slope of C_1D_1 and E_1F_1 equals the original price ratio CD. A_1 and B_1 are the points of tangency. It is apparent that, after the necessary reduction in spending (so that C_1D_1 coincides with E_1F_1), A_1 is likely to fall below and to the right of B_1. Hence to restore simultaneous internal and external balance requires an increase in the price of traded goods relative to non-traded goods.

When the terms of trade decline via a rise in import prices, the presumption is in favour of appreciation for reasons the reverse of those outlined above.

IV

While the analysis of terms of trade effect has been cast in terms of an exogenous movement, the same analysis can be applied to secondary terms of trade effects caused by domestic policies. In such cases, however, the analysis of terms of trade effects must be superimposed upon that of Section II. For example, consider a case such as that portrayed by Figure 1a—a situation of over-full employment and balance of payments deficit. The appropriate remedy is a cut in expenditure and devaluation or deflation. If application of these policies should lead to a secondary adverse movement of the terms of trade the analysis of Section III is also relevant. As has been shown, an adverse movement of the terms of trade also calls for a cut in spending, so that this part of the prescription is unaffected. Whether or not the prescription of devaluation is affected turns largely on how the secondary adverse movement of the terms of trade manifests itself—in falling export prices or rising import prices. The latter situation is unlikely for the reduced demand for imports—caused by lower expenditure and greater home production of importables—is more likely to lead to a fall in import prices. Section III shows that an adverse movement of the terms of trade reflected in lower export prices may require either devaluation or depreciation, although the presumption is in favour of devaluation. Consequently, the devaluation required to remove the original disequilibrium may need to be either more or less severe, with the presumption in favour of greater severity.

V

The analysis of the preceding sections is long-run in character; for it involves shifts in the structure of production which, in a world

where factors of production are not freely mobile, take a long period to become fully effective. In the short-run, where the proportions in which traded and non-traded goods may be produced is more or less determined by the current structure of production, the transformation curve approaches a right angle. Consequently, reactions to changes in the ratio of home to overseas prices are initially only on the demand side; supply reactions, while set in motion, contribute little in the short run either to external or internal equilibrium. In such circumstances, there are three means of achieving immediate equilibrium in the balance of payments. Figures 5a, 5b and 5c illustrate the three alternatives.

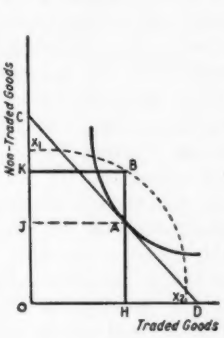

FIG. 5a

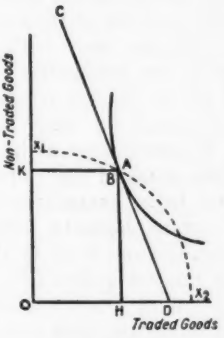

FIG. 5b

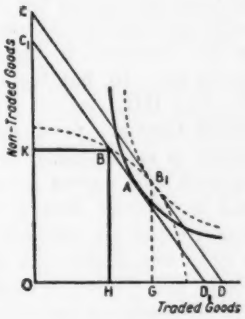

FIG. 5c

In each diagram, the broken curve is the long-run transformation curve, and the unbroken right angle KBH, the short-run transformation curve. Figure 5a illustrates the situation where the full burden of the short-run adjustment has been placed on the expenditure effect. The short-run transformation curve allows only the production of OH traded goods and OK non-traded goods to be consistent with internal and external balance. In order to reduce the demand for traded goods to OH, expenditure must be reduced to CD. However, at this level of expenditure the demand for non-traded goods OJ falls short of full employment output OK. Consequently there is domestic unemployment. This policy, then, is the familiar one of sacrificing full employment for the sake of balance of payments equilibrium.

Figure 5b illustrates the situation where the adjustment is wholly by means of relative prices. Expenditure equals full employment income; but compared to Figure 5a there has been a devaluation sufficiently great to lower the price of non-traded goods relative to traded goods to the point where the demand for each can be reconciled with the fixed short-run proportions in which they are produced. There are three objections to devaluation as a short-run remedy. First, the short-run elasticity of demand substitution between traded and non-traded goods may be so low that no conceivable exchange rate will equate demand with the fixed supply. In terms of the diagram, this is the

case when the short-run indifference curve also approaches a right angle. Second, such a severe devaluation would imply that producers of traded goods are earning large excess profits while producers of non-traded goods are making losses (although covering prime costs). Even though this situation will not persist, in the short run there is considerable distortion—and, in Australian conditions, a shift in the distribution of income towards farmers. The final objection is that a situation of balance of payments surplus and home over-employment will appear as the supply reactions become effective; and this will require correction by an appreciation of the exchange rate to yield a price ratio consistent with long-run equilibrium.

Figure 5c illustrates the alternative of import licensing. The level of expenditure and the relative prices of traded and non-traded goods —represented by CD—are those consistent with a long-run equilibrium at B_1. However, in the short run production consists of OH traded goods and OK non-traded goods. Import restrictions, represented by the line BH, restrict the demand for traded goods to the level at which they are produced, so preventing a drain on overseas funds. There is consequently excess demand for imports equal to HG. To prevent this excess demand being transferred to non-traded goods and so causing domestic over-employment, expenditure must be reduced below its long-run equilibrium level to C_1D_1. Such a situation is only temporary; for the relative prices of non-traded and traded goods will induce a movement of resources into the production of traded goods—a movement along the long-run transformation curve to B_1. Provided expenditure is eventually restored to CD a full equilibrium without import restrictions will eventually be reached.

This is perhaps the only respectable argument for import-restrictions: they enable us to "buy time"[14] while long-run supply adjustments are set in motion, so avoiding the necessity for wasteful short-run measures to achieve external balance, such as unemployment or a severe devaluation which will require reversal. However, this argument for import restrictions is only valid if either one of two conditions is realized: (i) there is no long-term fundamental balance of payments disequilibrium and the short-term situation is wholly the product of volatile terms of trade; or (ii), if there is such a disequilibrium, home costs and prices are such as to encourage a sufficient shift of resources into traded goods, and expenditure is not in excess of full employment levels.

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14. Swan, *op. cit.*, p. 4.

NOTES

EXPORT FRANCHISES OF AUSTRALIAN COMPANIES WITH OVERSEAS AFFILIATIONS

Recent emphasis on the importance to Australia of developing exports of manufactures has drawn attention to a disturbing feature of direct overseas investment in Australian manufacturing industries. This is the limitations which overseas principals are said to impose on the rights of their Australian subsidiaries or firms working under licence to sell their products outside Australia.

A recent survey by the Industries Division of the Department of Trade enables us for the first time to get a picture of the extent and nature of these restrictions on export franchises.* Both American and British connected firms were covered by the survey.

Of some 650 Australian firms which are subsidiaries of, or have a manufacturing agreement with U.S. firms, about 275 recorded their interest in export. Of this latter group, about 40 per cent are restricted by their principals from export to certain areas. (Nothing is known about franchise restrictions, whether academic or effective, on firms which have not expressed any interest in exports.)

There are 560 Australian companies which are subsidiaries of or financially linked to British firms. The number of Australian companies linked to British firms by licensing agreements is not known, nor is the number of Australian companies with British affiliations which have an export interest. Of the 71 companies with British affiliations which have reported restrictions on their export franchises, 60 are subsidiaries of or financially linked to British firms.

Table I tabulates the scope of the restrictions imposed on exports of firms with American connections. Table II gives the same information for firms with British connections.

These tables may give an unduly restrictive picture, especially in the case of U.S. restrictions, because only 39 subsidiaries and branches (out of a total operating in Australia of some 210) are included in the sample, the remainder being Australian companies working under licence. In general, one would expect subsidiaries to have wider export franchises than companies operating under a licensing agreement. The tables, however, bring out some interesting facts about the scope of franchise restrictions by American and British principals.

The restrictions take the form of limitations placed on the areas in which the Australian firms may market their products. A high proportion in both categories are limited to Australia, New Zealand and the Pacific islands. A number of firms, usually members of world-wide chains, have been established to cater for the local market only and may not export at all. (The number may be much larger than the tables suggest if a proportion of those disclaiming any interest in

* The authors are indebted to the Secretary, Department of Trade, for making the results of the survey available for publication.

TABLE I

Restrictions on Export Franchises: Companies with American Affiliations

	Number of Companies	%
Sales limited to:		
1. Australia	4	4
2. Australia and Australian Territories	3	3
3. Australia and New Zealand	16	16
4. Australia, New Zealand and South Pacific Islands	18	18
5. Australia, New Zealand, South Pacific Islands and Asia	19	19
May not export to:		
6. United States alone or with one other country	4	4
7. North America	7	7
8. North and South America	2	2
9. North and South America, Europe, United Kingdom and Africa	6	6
10. *Restricted but area not given*	7	7
11. *Restricted with respect to one or two "brand-name" products*	16	16
Total	102	

TABLE II

Restrictions on Export Franchises: Companies with British Affiliations

	Number of Companies	%
Sales limited to:		
1. Australia	4	6
2. Australia and Australian Territories	7	10
3. Australia and New Zealand	10	14
4. Australia, New Zealand and South Pacific Islands	18	25
5. Australia, New Zealand, South Pacific Islands and Asia	7	10
May not export to:		
6. United Kingdom	2	3
7. United Kingdom and Europe	4	6
8. United Kingdom, Europe and Africa	4	6
9. United Kingdom and North America	1	1
10. *Restricted but area not given*	9	13
11. *Restricted with respect to one or two "brand-name" products*	5	7
Total	71	

exports ought to be included in this category.) A significant proportion of the restrictions keeps the products of the subsidiary out of the home market of the principal. These generalizations apply to both American and British connected firms. But there are some interesting differences.

British restrictions on export to Asia are notably more widespread than corresponding American restrictions: 55 per cent of British connected firms are limited, but only 40 per cent of American. Two reasons may be given for the difference. First, the British principals are much more likely to have established connections of their own with Asian markets, or subsidiaries in countries like India, than are American companies. Secondly, during the post-war years of widespread dollar shortage, American companies, unable to sell their dollar products directly in Asian markets, have been more willing to allow their soft-currency Australian subsidiaries to supply these markets; this consideration has not affected British companies. For both reasons the difference in this respect between British and American practice may diminish, as American trade with the Asian countries expands and dollar restrictions are eased.

Much the same proportion of American and British principals appears to exclude the products of their Australian subsidiaries from their home markets, but there is naturally a greater British interest in the European market, while only American connected firms are specifically excluded from Latin-American markets. As we would expect, some American principals ban exports to "Iron Curtain" countries, including Communist China, while some British restrictions prevent the sale of the products concerned to the Australian Government for re-export under the Colombo Plan.

A provision much more common in American than British restrictions is a prohibition of the export of one or more "brand-name" products of the Australian firm whose other products may be exported freely.

Generally, the restrictions seem to be spread evenly through the range of manufacturing agreements. There is a suggestion that there is a specially high incidence of restrictions in the chemical and engineering fields where innovations and technical know-how are particularly important reasons for entering into a manufacturing agreement. Other prominent groups of products are clothing and cosmetics where fashions and brand names are major considerations.

So much for the facts which emerge from the Department of Trade survey data. The motives of overseas companies in imposing restrictions on the right of Australian subsidiaries or licensed firms to export are fairly obvious. From the point of view of the overseas principal, nothing is gained by competition from its Australian subsidiary in its home market or in established export markets in other countries supplied either by the parent company or by subsidiaries in these or neighbouring countries.[1] From the point of view of Australia, however, it may be a serious matter if a significant proportion of the firms in its manufacturing industries, and not improbably the most

1. This may need some qualification. Occasions can and do arise where a sale lost by a principal to a subsidiary, either in the principal's home or (more likely) overseas market, would otherwise have been lost to a competitor of the principal. But this line of reasoning does not at present seem to be widely accepted by overseas firms.

up-to-date and therefore most competitive firms, are not interested in export or are hamstrung by franchise restrictions. There is here a clear conflict of interest between the overseas investor and the borrowing country.

Whether such franchise restrictions are as yet sufficiently important to warrant Government action the scanty information at our disposal does not enable us to say. There may, for instance, be a case for making the grant of import licences to companies with overseas affiliations conditional upon assurances that no formal restrictions will be placed on their export franchises. Only the authorities are in a position to decide whether such action would be unduly deterrent or, on the other hand, futile because unenforceable. Meanwhile, the Department of Trade is to be commended for its efforts to gather and make available the facts on this matter.

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TWENTY-ONE YEARS OF GUARANTEED PRICES FOR BUTTER AND CHEESE IN NEW ZEALAND

1. *The Problem of Guaranteed Pricing*

Prices may be looked at as the agent which distributes income to producers. And this is indeed how many producers look at the pricing process. On the other hand, prices marry demand with supply. In static equilibrium this allocation aspect of pricing provides producers also with a normal income. In the real world, however, the allocation function of pricing may lead, at least temporarily, to prices well in excess of cost-of-production (including normal profit) or well below normal incomes. This will be the case in particular in industries like the New Zealand dairy industry where factors are highly specific and where, for that reason, supply is unresponsive, in the short run, to changes in market price. Under conditions of welfare state ideology, producers may ask for a guaranteed price when market realizations do not cover their conventional cost-of-production. The logical implication of such a request, which is based on preference for income security over risk from market fluctuations, is that prices ought to be set according to pure income standards in times of excess realizations as well as in times of losses.

The problem of guaranteed pricing then becomes to what extent a divorce of the income from the allocation aspect of pricing is possible not only in times of market realizations not covering normal incomes, but also in times of market prices which, if freely distributed, would return incomes well in excess of normal. The history of the guaranteed price for butter and cheese in New Zealand provides interesting material for the study of the problem of pricing divorced from market realizations.

2. *The First Period of Guaranteed Prices: 1936-41*

The depression of the 'thirties led to a violent fall in the price of butter and cheese on the London market. In 1934 a survey found that "it is likely that at least 50 per cent of the dairy farmers of the Dominion are, in varying degree, unable at the present time to meet their financial commitments".[1] The victory of the Labor Party in 1935 was partly due to their election promise "to ensure the payment to the farmer of a price for his production that would cover all his working expenses and secure to the farmer an income in accordance with the time, skill, energy and experience used by him in producing the commodity".[2]

The election promise was honoured by passing in 1936 the Primary Products Marketing Act which was entitled: "An Act to make better provision for the marketing of dairy produce and other primary produce, so as to ensure for producers an adequate remuneration for the services rendered by them to the community."

During the early history of the guaranteed price, the income aspect of pricing was stressed to the exclusion of almost every other aspect. Section 20, Clause 4 of the 1936 Act provided that the guaranteed price should assure dairy farmers of a "reasonable state of comfort" for themselves and their families. When, therefore, in view of low overseas realizations, the guaranteed price for 1938-39 was fixed on a level which, from an income point of view, appeared to be unsatisfactory to the industry the industry's spokesman complained that "the price which the Government has decided to pay to the dairy farmer this year is obviously not based on the principles laid down in the Primary Products Marketing Act, but upon a figure which must have been arrived at mainly on a consideration of market realizations, leaving the farmer to carry the steadily increasing burden of costs".[3]

The Government had indeed been moved by consideration of market realizations. It emphasized that the incomes of dairy farmers could not be divorced from the incomes of the community as a whole —these incomes being largely determined by the export proceeds from our produce. "It will be impossible to ensure the continuance of a reasonable state of comfort if prices are fixed at levels so high as to render it impossible to avoid deficits in the Dairy Industry Account of such magnitude as necessarily to react to the detriment of the general standard of living of the community."[4]

The representatives of the dairy farmers were dissatisfied with the Government's move away from pure income-pricing. They complained that the price fixed by the Government did not take into account the increasing burden of cost, due largely to rising wages. The Government was much impressed by this argument and endeavoured to negotiate

1. *Dairy Industry Commission Report*, 1934 (Parliamentary Paper, 1934, H-30), p. 65.
2. W. Nash, *Guaranteed Prices, Why and How* (Wellington, 1935), p. 5.
3. *Fourteenth Annual Report*, N.Z. Dairy Board, p. 10.
4. Government statement quoted in *Annual Report*, Primary Products Marketing Department, 1938, p. 9.

a standstill agreement on wages with the New Zealand Federation of Labour.[5] Since the income standard of "reasonable comfort" implied a comparison between the standard of living of dairy farmers and those of others in New Zealand, the logical conclusion was that the guaranteed price could be kept under control only if the incomes of all other New Zealanders were also controlled. In line with this policy the Economic Stabilization Conference, held in September 1940, decided that no change in relative incomes should be pressed for as long as the war emergency lasted. In this case wartime exigencies facilitated guaranteed price policies.

While the dairy industry was by no means satisfied with this course of action it offered its co-operation in view of the national emergency.[6]

Thus it can be seen that, during the first period of the guaranteed price, the income function of pricing was predominant, but that it created difficulties in terms of problems of internal excess demand as well as of fixation of relative incomes. The outbreak of the war suppressed some of the more serious implications of these problems but did not do so completely.

3. *The Second Period of Guaranteed Prices: 1942-56*

By 1942 it had become clear that a fixation of guaranteed prices with the sole objective of income stabilization had the effect of reducing the supply of dairy produce. Undoubtedly the depletion of the labour force, due to the war, and the lack of fertilizers had an effect on the supply position, but just as undoubtedly the feeling of frustration of "stabilized" dairy farmers led to a decline in production as can be seen from the following table:

TABLE I

New Zealand Dairy Cow Numbers and Butter Fat Production, 1933-34 to 1946-47

Year	Dairy Cows in Milk (in thousands)	Butter Fat Processed (million lb.)
Average		
1933-34 to 1937-38	1,787	437·9
1938-39	1,724	400·3
1939-40	1,719	430·6
1940-41	1,759	466·3
1941-42	1,757	437·3
1942-43	1,715	406·8
1943-44	1,648	387·3
1944-45	1,679	431·7
1945-46	1,662	372·7
1946-47	1,658	408·1

Source: *Thirty-first Report*, N.Z. Dairy Report, pp. 16 and 20.

Early in 1942, after the Court of Arbitration had granted a 5 per cent wage rise to workers, the Government seized the oppor-

5. *Fifteenth Annual Report*, N.Z. Dairy Board, pp. 4 and 5.
6. *Seventeenth Annual Report*, N.Z. Dairy Board, p. 7.

tunity to increase the guaranteed price and, in 1943, a Dairy Industry Costs Adjustment Committee was set up which led to the granting of generous "cost allowances" to dairy farmers. Recognizing for the first time the relation between prices and production (as opposed to that between prices and fair incomes) the Minister of Marketing stated: "In view of the fact that an agreement has now been reached which constitutes a complete settlement of all the dairy industry claims I wish to make an appeal to all dairy farmers to maintain their production and increase it to the greatest extent possible."[7]

Overseas realizations for dairy produce rose steadily in the meantime. While the greater part of war-time price increases were withheld from dairy farmers and put into a Dairy Industry Stabilization Account, pressure to relate pay-out to realizations became much stronger. But the argument for higher pay-outs remained on the level of relative incomes. When appeals were made to the dairy industry for greater production, the reply was "if farm labour was put on a basis with industrial labour . . . the decline would be arrested and a gradual increase would result".[8] The consequence of this pressure was an increase in the guaranteed price. But in order to maintain the fiction of relative income stabilization, certain portions of the increased pay-out to dairy producers were not incorporated in the guaranteed price but were given as so-called cost allowances over and above the guaranteed price proper.

By 1946 the Government had finally acknowledged the incentive function of pricing and increases in the guaranteed price were granted as much for maintaining the relative income position of dairy farmers (cost allowances) as "to enable farmers to attract and hold farm labour and to bring dairy farms into full scale production".[9] Nevertheless pay-out to the industry was still well below overseas realizations and the Dairy Industry Stabilization Account continued to grow.

With the establishment of so-called cost-standards, increases in the guaranteed price became semi-automatic and, in 1947, the Government handed over the function of guaranteed price fixation to a newly-created Dairy Commission containing equal representatives of industry and Government under a commonly-agreed chairman. The Government reserved the right to be consulted if a price should be fixed which exceeded overseas realizations. While reference in the principles of price fixation in the 1947 Dairy Products Marketing Commission Act was made to "the promotion of the general economic stability in New Zealand" no express instruction appears that returns from overseas realizations should be taken into account when fixing prices.[10] On the face of it, the guaranteed price remained, therefore, exclusively a form of income distribution, assuring the dairy farmer of a sufficient net return to enable him to maintain himself and his family in reasonable comfort.[11]

7. *Nineteenth Report*, N.Z. Dairy Board, p. 5.
8. *Twentieth Report*, N.Z. Dairy Board, p. 3.
9. *Twenty-second Report*, N.Z. Dairy Board. p. 5.
10. *First Report*, N.Z. Dairy Products Marketing Commission, p. 12.
11. *Ibid.*

The semi-automatic method of guaranteed price fixation led to a rapid rise in guaranteed prices, well devised to give an incentive to dairy farmers to improve their properties and increase production.

One of the most interesting aspects of the price-fixing activities of the New Zealand Dairy Commission has been the automatic incorporation into the guaranteed price, up to 1954, of general wage increases granted by the Court of Arbitration to wage and salary earners. This practice increased, of course, the inflationary impact of general orders of the Arbitration Court.

By 1952 the guaranteed price formula had become quite out-of-date. When established in 1936, the structure had been based on the idea that a dairy farmer, operating an average farm of 48 cows, could do this only with the help of a full-time farm hand or his equivalent in family labour. By 1953, the average number of cows had increased to 59, and average wages actually paid were not much in excess of £200 per year.[12] In other words, when the labour reward per lb. of butterfat produced was increased, dairy farmers received additional income not only in excess of what had been planned when the guaranteed price formula had been constructed, but also for wage payments which the farmer did not, in fact, make. Other anomalies had also arisen.[13]

In spite of the increases in pay-out to farmers, with rising London realizations, the guaranteed price remained below prices actually received abroad and the Dairy Industry Account, into which surpluses were paid, kept on increasing. Table II below shows the relation of New Zealand prices to realized prices and also the actual surplus credited to industry reserve funds year by year:

It can be seen from Table II that only in two years out of sixteen listed did the guaranteed price for butter exceed overseas realizations and only in one year did the guaranteed price for cheese do so. The dissatisfaction of the dairy industry with this state of affairs found expression in the 1952 recommendations formulated by the Guaranteed Price Committee of the New Zealand Dairy Board.[14] In view of the approach to free marketing of dairy produce in Britain after over twelve years of effortless bulk-selling on a Government-to-Government basis, the Dairy Board's Price Committee recommended that, at least until the end of the 1954-55 season, the guaranteed price should serve as a floor price only; all realizations were to be handed over to the industry, for the benefit of dairy farmers or dairy companies. "In arriving at this conclusion the parties have in mind that trading in overseas markets demands every effort on the part of the dairy farmer and dairy factory to produce and process a product of the highest quality."[15] The wheel had gone full circle. The industry which in 1938 had so violently attacked the Government for basing the

12. N.Z. Department of Statistics, *Survey of Dairy Farmers' Incomes*, 1954-55.
13. For instance the allowance for returns from pigs remained unchanged in spite of increased prices for pig meat. Against this must be set the reduced numbers of pigs kept by dairy farmers.
14. *Twenty-eighth Report*, N.Z. Dairy Board, pp. 6-7.
15. *Ibid.*, p. 7.

TABLE II

Guaranteed and Realized Prices for New Zealand Dairy Produce and Changes in Dairy Industry Reserve Accounts, 1936-37 to 1951-52

Year	Prices per cwt. in £N.Z. Butter U.K. Price	Butter G'td Price	Cheese U.K. Price	Cheese G'td Price	In £N.Z. m. Dairy Industry A/c. Accumulated Balance	Dairy Industry A/c. Increase or Decrease
1936-37	116/6	117/3	68/10	65/11		
1937-38	132/10	127/6	73/3	72/4	0·6	+0·6
1938-39	129/10	139/–	64/8	78/7	−1·9	−2·5
1939-40	139/11	139/–	79/11	78/7	−1·9	nil
1940-41	139/11	139/–	79/11	78/7	−1·7	+0·2
1941-42	139/11	139/–	87/1	78/7	−0·9	+0·8
1942-43	145/6	143/8	90/10	81/6	−0·2	+0·7
1943-44	178/–	151/9	106/4	85/10	2·5	+2·7
1944-45	187/2	168/7	110/8	95/3	4·4	+1·9
1945-46	187/2	176/9	110/8	99/2	4·3	−0·1
1946-47	217/8	200/1	127/6	111/4	6·7	+2·4
1947-48	255/–	222/7	146/9	121/11	12·7	+6·0
1948-49	235/11	229/7	133/6	126/3	15·3	+2·6
1949-50	253/5	241/5	142/–	133/–	18·5	+3·2
1950-51	272/6	266/9	151/7	146/2	23·0	+4·5
1951-52	293/1	287/6	162/1	158/8	24·6	+1·6

Source: *Twenty-seventh Report*, N.Z. Dairy Board, p. 31.
Note: During the war and some time after, certain subsidies were debited to the Dairy Industry Account with the result that the increase of the accumulated balance was slowed down and even reversed as was the case in 1945-46. Regarding the stabilisation aspect of Industry Accounts, see the author's article on "State Regulation of Farm Incomes in New Zealand", *Bulletin* of Oxford Institute of Statistics, April, 1949.

pay-out in the guaranteed price formula on market realizations instead of on pure income considerations now claimed that price meant more than just income, it also meant correct allocation of factors. And if the industry was not given the full price, resource allocation could not be optimized.

Nevertheless memories of the income approach to pricing remained strong and the recommendations which were agreed to by the Government stated:

> The purpose of the guaranteed price scheme is to stabilise the income of the dairy farmer and to give him some certainty as to probable farm income in any production season.
>
> Over a long period of years the guaranteed price scheme must be to a large extent self-balancing. It is agreed that the existing reserves, wisely used, will help to cushion price falls over a number of years; and that in the interests of the national economy, and for the welfare of the dairy industry, if and when reduction becomes necessary, prices to producers of butter and cheese should be reduced gradually and in harmony with reductions in real income born by other sections of the community.[16]

Following the agreement reached between the Government and the dairy industry (represented by the N.Z. Dairy Board) there was a full pay-out of realizations from 1951-52 onwards. Small deficits in

16. *Ibid.*

the Dairy Industry Reserve Account were incurred during 1953-54 and 1954-55, and reductions in the guaranteed price were made. The price was no longer fixed by reference to cost standards for the years 1954-55 to 1956-57.

The new approach to pricing—as a means to allocate resources correctly, as well as a means to obtaining a fair income for producers —was incorporated in the 1956 Dairy Products Marketing Commission Amendment Act. The provisions of this Act omit reference to the requirement that the guaranteed price should assure dairy farmers of a reasonable state of comfort. Instead for the first time, reference is made to the need for local pay-outs to be related to overseas realizations. At the same time the idea of income stabilization was not completely abandoned. The 1956 Amendment provided for a floor price based on "the basic cost of production of butter for the 1957-58 season".[17] Reductions in price, in line with falling overseas realizations, were not to exceed 5 per cent per annum. On the other hand there was no bar in the Act to payments exceeding the predetermined cost-standard. In fixing the actual pay-out to producers the following principles were to be considered:

(a) The necessity in the public interest of maintaining the stability and efficiency of the dairy industry.
(b) The cost of production of butter.
(c) The amount which butter and cheese acquired by the Commission is realizing.
(d) The ruling level of prices for farm produce other than dairy produce.
(e) The estimated cost to the Commission of marketing the butter or cheese concerned and the cost of administration.
(f) Any recommendation made by the Dairy Board.
(g) Any other matters deemed to be relevant.

Only clauses (a) and (g) remain identical with former guaranteed price principles. Clause (b) replaces cost of production of butter and cheese by cost of production of butter only. The reason is that this gives formal recognition to the use of the price mechanism for switches from butter to cheese and vice versa. The Dairy Produce Prices Authority (created by the new Act) can fix the price of butterfat for cheese with the sole aim in mind of achieving the best resource allocation in view of marketing conditions. Reference has already been made to the revolutionary character of clause (c) in terms of guaranteed price history. Clause (d) acknowledges the opportunity cost character of price, and thus introduces a further principle of sound resource allocation. Clauses (e) and (f) emphasize the growing interest which producers have been taking in the proper marketing of their production.

4. *Recent Developments*

With the rapid fall in the price of dairy produce which started in 1956-57 and continued through 1957-58, a testing time came for the

17. *Thirty-third Report*, N.Z. Dairy Board, p. 17.

principles of guaranteed price fixation. The existing reserves proved to be inadequate. By June, 1958, not only had all the £27m. Industry reserves been spent in paying a guaranteed price far in excess of overseas realizations, but an additional £12 million had been borrowed from the Reserve Bank. In this situation it became imperative for the guaranteed price to be reduced faster than was provided for by the 1956 Act. Thus, in September, 1958, an Act was passed, suspending for one year the operation of the clause in the original Act which limits reductions in the guaranteed price to 5 per cent each year.[18]

The actual reduction effected was one of 10 per cent, reducing the pay-out for butter to 32d. per lb. of butterfat and for cheese to 35d.

The attitudes of both the industry and the Government on this occasion showed clearly that neither was prepared to face a return to a system where incomes are determined exclusively by the laws of the market. At the new prices farmers will receive approximately £316 a ton for butter and £191 for a ton of cheese. While the London price of cheese has at present (October, 1958) risen slightly above this guaranteed price, the London price of butter has only reached £235 per ton, so that the Government is facing a subsidy payment of about £81 a ton of butter if prices do not improve. With a potential export of 175,000 tons of butter it is clear that the Government is determined to stand a heavy cost of protecting the industry from the worst effects of overseas price fluctuations.

The announcement of the reduced guaranteed price was accepted by the industry without much real opposition, although there was no lack of words. A statement by the dairy industry said: "The dairy industry is well aware that, over a reasonable period, it must live on the prices realized overseas".[19] In order to emphasize the provisional character of the dairy price subsidy given by the new guaranteed price, the ensuing deficit is called a loan to the industry, repayable out of excess proceeds in the future. In fact this means that the New Zealand dairy industry has now given its consent, in the interests of income stabilization, to divorcing its local receipts from overseas prices in good as well as in bad times.

We can conclude that both the New Zealand dairy industry and the Government have opted for a pricing system which puts emphasis on the income-distributing function of pricing. Some concession had to be made to the resource allocation function of pricing, but essentially victory has gone to the "price fixers".

In conclusion it may be worth while to quote Professor Murphy's verdict on State fixation of wages in New Zealand—which applies with equal force to the State fixation of dairy produce prices—and experience has already proved the wisdom of Professor Murphy's dictum: "Since all distributive shares are interrelated, the authority will sooner or later be forced, in deciding what are 'fair' wages, to determine what constitutes 'fair' rent, interest and profit. In the final analysis this

18. Dairy Products Marketing Commission Amendment Act, 1958.
19. Statement in the Dairy Industry Information Service, published in the Christchurch *Press*, 9/9/58.

leads logically and inexorably to State distribution of wealth, that is to socialism."[20] Even though one may doubt the appropriateness of the term "socialism" for the scheme of things towards which the institution of a guaranteed price for dairy produce tends, there can be little doubt that the present crisis in New Zealand's export marketing shows the tremendous strength of State-capitalist thinking on both sides of the political fence in this country.

Postscript, July 1959

Since the above was written the London price for butter has moved up to 370/- per cwt. compared with the guaranteed price equivalent of 315/- per cwt., the price of cheese has risen to 291/- per cwt., the guaranteed price equivalent being 210/- per cwt. This development has led to the possibility of the industry paying back part of the overdraft incurred with the Reserve Bank of New Zealand during 1958-59. The Government has proposed that fifty per cent of any annual trading surplus in the Dairy Industry Account should be placed to reserve and the remaining fifty per cent be made available to producers. A discussion which has started around the relation between butter and cheese guaranteed prices (that for cheese producing a far greater surplus than that for butter) has led to a doubling of the differential for cheese from 3d. to 6d. per lb. of butterfat.

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THE VALUATION OF STOCK CHANGES[1]

Social accounting convention usually requires that changes in stocks throughout the year should be valued at current replacement prices; the annual change in the value of stocks would then represent the change in physical quantities at prices current during the year. Since commercial accounting records, the main source of national income statistics of stock changes, are based on different conventions an adjustment to the data is necessary if social accounting requirements are to be met.

The method most commonly adopted by accountants is to value stock used at its original cost on the assumption that it is used in order of acquisition (the first-in first-out or FIFO hypothesis). The unit FIFO cost of material used in the *nth* period, p'_n, is

$$(1) \qquad p'_n = \sum_{r=r'}^{n} p_r q_{rn}/u_n$$

where p_r = price of stock in the *rth* period, q_{rn} = quantity of stock purchased in the *rth* period and used in the *nth* period, u_n = quantity of stock used in the *nth* period, and r' = period of the first purchase of the stock existing at the beginning of the *nth* period when the

20. B. E. Murphy, *Outlines of Economics* (Wellington), p. 240.

1. I am indebted to Professor C. G. F. Simkin for discussion and criticism.

FIFO principle is followed. The annual change in the quantity of stock, S, is

$$(2) \qquad S = \sum_{n=1}^{k} (q_n - u_n)$$

where k = the number of equal stock accounting periods in the year (e.g. daily, weekly, monthly, etc.); the social accounting value of this change, I, is

$$(3) \qquad I = \sum_{n=1}^{k} p_n(q_n - u_n).$$

On the other hand the FIFO valuation, F, is

$$(4) \qquad F = \sum_{n=1}^{k} (p_n q_n - p'_n u_n)$$

which departs from social accounting conventions by

$$(5) \quad F - I = \sum_{n=1}^{k} u_n(p_n - p'_n).$$

Equation (5) shows that FIFO valuation meets social accounting requirements only if $p_n = p'_n$. That is: if prices are constant between periods r' and n; or if initial stocks are zero and $q_n = u_n = q_{rn}$ $(n = 1 \ldots k)$; or if prices fluctuate in a random manner such that $p_n = p'_n$. But with steadily rising prices, $p_n > p'_n$ and $F > I$ irrespective of whether the annual change in the quantity of stocks, $\sum_{n=1}^{k} (q_n - u_n)$, or one or more of the periodical changes, $q_n - u_n$, are positive, zero, or negative. Conversely, if prices are falling. An adjustment to accounting data (stock appreciation), equal to $F - I$, is therefore required for social accounting purposes.

Other methods of valuing stock changes are employed by commercial accountants, the most important being LIFO, the last-in first-out hypothesis, in which most recently acquired materials are deemed to be used first. The unit LIFO cost of material used in the *nth* period, p^l_n, is

$$(6) \qquad p^l_n = \sum_{s=s'}^{n} p_s q_{sn}/u_n$$

where $s = sth$ period, and s' = period of first purchase of material counting backwards from the time of the last purchase of the stock existing at the end of the *nth* period when the LIFO principle is followed. The LIFO valuation of the annual stock change, L, is

$$(7) \qquad L = \sum_{n=1}^{k} (p_n q_n - p^l_n u_n)$$

and this departs from social accounting requirements by

$$(8) \quad L - I = \sum_{n=1}^{k} u_n(p_n - p^l_n).$$

Equation (8) shows that LIFO valuation meets social accounting

requirements if $p_n = p^l_n$. That is: if all material used in each period is purchased in that period ($u_n \leqslant q_n$); or if prices are constant between periods s' and n; or if prices fluctuate in a random manner such that $p_n = p^l_n$. But with steadily rising prices and if also $q_n < u_n$, then $p_n > p^l_n$, $L > I$, and there is positive stock appreciation. Conversely, if prices are falling. Stock appreciation, in the case of LIFO, will not be as large as in the case of FIFO, because the earlier time period of valuation is less distant (r is counted forward to n, whereas s is counted backward from n).

With respect to LIFO practice, United Kingdom statisticians claim that "when the volume of stocks is rising the materials used at any time are thus valued at approximately the prices prevailing at the time of use"; this is practically identical with the "national income method of charging materials used at replacement cost. Stock appreciation would not then arise."[2] This view is supported by United States Department of Commerce statisticians who assert "to the extent that the physical volume of inventories increases, changes in the book value of LIFO inventories already reflect changes in the physical volume expressed at current prices and no adjustment of these book values is needed".[3] United Kingdom statisticians go further. "So long as the physical volume of stocks is unchanged it is valued at the same prices as opening stock and no change in prices during the accounting period is reflected in a change in the value of stocks."[4]

Symbolically, these statements mean that if $\sum_{n=1}^{k} (q_n - u_n) \geqslant 0$ then $L - I = 0$; but, as noted above, this is not correct unless, in addition, $q_n \geqslant u_n$. The possibility of stock appreciation when $\sum_{n=1}^{k} (q_n - u_n) \geqslant 0$ yet $q_n < u_n$ is of practical importance since ups-and-downs in stock throughout the year, culminating in an annual increase, is a realistic possibility. The tendency towards stock appreciation will, of course, be stronger if there is an annual decrease in the volume of stocks because the gap between q_n and u_n, p_n and p^l_n, and L and I would be greater.

Ideally, it has been noted, stock changes should be valued at prices current at the time of the changes but, in practice, the information does not exist for estimates to be made on this basis, and consequently an indirect approach has to be used. Basic techniques for adjusting commercial accounting data were first outlined by Kuznets[5] and his approach has been used by both United States and United Kingdom statisticians. The method used is to revalue the change in stocks at the average of current year prices, the book values

2. Central Statistical Office, *National Income Statistics, Sources and Methods*, 1956, p. 311.
3. United States Department of Commerce, *National Income 1954*, p. 137.
4. C.S.O., *ibid.*
5. "Changing Inventory Valuations and their Effect on Business Savings and on National Income Produced", *Studies in Income and Wealth*, Vo. 1, 1937.

being regarded as at the prices current during the last stock turnover period (cost) or at the prices at the end of the year, whichever is the lower. This last proviso is made to comply with the accounting convention of "cost or market value, whichever is the lower" in valuing stocks. The above method does not give the same result as would a complete revaluation at replacement cost of materials added to or withdrawn from stocks because a simple average of prices during a year will not be the same as an average of daily prices weighted by the daily stock change, that is,

$$(9) \quad \sum_{n=1}^{k} p_n/k \neq \sum_{n=1}^{k} p_n(q_n - u_n) / \sum_{n=1}^{k} (q_n - u_n).$$

The two would be the same only if the quantity of stocks either rose or fell at a uniform rate during the year (i.e. $q_n - u_n$ is constant).

The method outlined above is based on the assumption that accounting practice accepts FIFO. In the United Kingdom it is assumed that these conventions apply to all stocks, although it is realized that other methods of valuation (e.g. LIFO, standard costing, and average pricing) exist and are used to minimize the effect of price variations on stock values. Official estimates, accordingly, understate the physical increase in stocks if stock appreciation is negative, and overstate it if this is positive; they assume a systematic bias and make a rough adjustment for it.[6] United States Department of Commerce statisticians,[7] however, deduct the value of LIFO stocks from total stocks and, if the physical volume has increased, make no adjustment, whereas if the physical volume has decreased their adjustment is similar to that used in the FIFO case.

The statistical treatment of LIFO stocks is unsatisfactory and causes bias in the estimates of the value of total stock changes, but if LIFO stocks are a small proportion of total stocks this bias will be unimportant.

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MEASUREMENT OF THE IMPORTANCE OF FOREIGN TRADE FOR AN ECONOMY

It is usual to indicate the importance of foreign trade for a country by giving the value of trade (exports, imports, or exports plus imports) as a percentage of national income. This is open to an objection which may be illustrated by the following example. Suppose there are two countries *A* and *B*, each with a national income of 100, exports of 30, imports of 30. *A* exports agrarian products containing hardly any foreign (imported) productive resources; suppose their import content is 3. *B* exports cut diamonds only; the rough diamonds are imported, and the value added in *B* is only 3, so that the import-content of *B*-exports is 27. The usual way of indicating the importance

6. C.S.O., *op. cit.*, p. 313.
7. Department of Commerce, *op. cit.*, p. 137.

of foreign trade gives the impression that it is the same for *A* and for *B*, but it is obvious that this impression is false. In *A*, a large portion of national income and employment depends on trade; in *B*, only a small portion. If trade were disrupted, *A*'s economy would be crippled, *B*'s would be affected only slightly.

This simple example shows that it is better to indicate the importance of trade for a country by expressing the value of exports net of import-content as a percentage of national income, and to compare this for several countries. One could, of course, also express the value of imports that remain in the country (that do not go into exports) as a percentage of national income.

The following table shows exports as a percentage of national income, the import content of exports, and exports net of import content as a percentage of national income for some countries. The number of countries in the tables is small because the data required for calculation of the percentages in Tables I and III are not available for more countries.[1] Calculation requires full input-output tables; the import content of exports can be calculated by inversion of the matrix. An estimate of the percentage ratio exports net of imports to national income has been made for the Netherlands (1954), and also for Denmark, without the basis of full input-output tables. The method employed must result in underestimation of the import content of exports, so that the percentages for the Netherlands (1954) and for Denmark are no doubt too high.

TABLE I

Export and Import Ratios

	Ratio of Exports to Nat. Income	Import Content of Exports	Ratio of Exports net of Import Content to Nat. Income
	%	%	%
United Kingdom (1950) ..	23·8[1]	21·4[1]	18·7
Netherlands (1950)	34·3[2 3]	34·6[2]	22·5
Netherlands (1954)	43·5[2 3]	—	32·6
Denmark (1949)	21·7[6]	—	18·6[6]
New Zealand (1952-3)	36·9[4]	12·2[5]	32·5

References:

1. National Income and Expenditude, 1939-55, H.M.S.O., London.
2. Stat. en Econometrische Ond., 4th quarter 1954.
3. International Financial Statistics.
4. Report on Inter-Industry Study of the N.Z. Economy, 1952-3.
5. N.Z. Official Estimates of National Income and Sector Accounts, 1955-6.
6. Mimeographed Study of Danish Statistical Department, 1955.

The final percentage ratios are, of course, smaller than the first. The interesting thing is that the differences are not the same, the final percentages being smaller than the initial by the following percentages: United Kingdom 21, Netherlands (1950) 34, Netherlands (1954) 25,

1. Except for the United States, but we have not included that country because of the small importance (relative to national income) of her trade.

New Zealand 12, Denmark 14. The percentages for Netherlands (1954) and Denmark must be too low, owing to the method of estimating mentioned above. We can compare the percentages for the United Kingdom, the Netherlands (1950) and New Zealand, and also those for the Netherlands (1954) and Denmark (suffering from the same sort of under-estimation). There is a great difference between the percentage for New Zealand (12) and that for the Netherlands (1950) (34). The exports of New Zealand consist exclusively of agrarian products, the exports of the Netherlands mainly of manufactures, and this country is very poorly endowed with the natural resources required for their production. The Dutch export also agrarian products such as cheese, eggs, bacon, but the relatively small size of their country in relation to its population compels them to import large quantities of fodder for their production; such imports are not required by New Zealand. The United Kingdom's percentage (difference) lies between the New Zealand and the Dutch figures. The United Kingdom exports manufactures, but is better endowed with natural resources than the Netherlands and is a larger economy, producing a greater variety of products (the Netherlands, for instance, import tractors and commercial vehicles; the United Kingdom does not because she produces them herself). The difference for the Netherlands (1954) is greater than for Denmark, because in Danish exports agrarian products occupy a much larger place than in Dutch exports.

The "crude" ratios exports/national income suggest that trade was almost as important for the Netherlands (1950) as it was for New Zealand (1952-3), but according to the "refined" ones the importance was much greater for New Zealand. "Importance" means importance for national income and employment.

If and when input-output tables for more years and more countries are published, the calculation of the ratios of exports net of import content to national income can be extended, and conclusions will have a more solid basis.

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INDUSTRIAL CONFLICT IN AUSTRALIA

Please record applause from the wings for Dr. Isaac's article on collective bargaining.[1] Dr. Isaac has carefully voiced and soundly argued many criticisms of arbitration which spring from comparing it with collective bargaining. So much so that it is unnecessary to state them again with the different slant of evidence deriving from the researches of an industrial psychologist.[2] There are, however, two import-

1. J. E. Isaac: "The Prospects for Collective Bargaining in Australia", *Economic Record*, Vol. XXXIV, No. 69, pp. 347-361.

2. E. P. Kelsall, "Compulsory Arbitration and Industrial Conflict in Australia" —Thesis (unpublished) in Central Library of University of London, Birkbeck College Library and British Library of Political and Economic Science, 1955.

ant possibilities which Dr. Isaac leaves open and which a contribution from this research can definitely close. That is the purpose of this article.

On page 351 Dr. Isaac in stating the case against compulsory arbitration concedes the possibility "that prompt intervention and the imposition of arbitration awards reduce the incidence of stoppages". Secondly, on page 352 he refers to "disputes or stoppages which create conditions of national emergency" with the implication that compulsory arbitration may be necessary to prevent or settle these. Both possibilities take us back to the prime reasons which originated our compulsory arbitration system and the main duty laid upon it.

Major strikes in the 1890's had an important effect on the climate of opinion in which the early proposals for compulsory arbitration were formulated and eventually established. Until 1930 the prime object of the Commonwealth Conciliation and Arbitration Act read "To prevent lock-outs and strikes in relation to industrial disputes". Since then this has been stated less directly and may now be summarized as "the prevention and settlement of industrial disputes and the promotion of goodwill in industry". Although the various State systems differ to some extent from each other and from that of the Commonwealth, they were established for much the same purpose; and the Commonwealth system has developed to dominate their work and their influence. Dr. Foenander has summed up the main object of the Australian system as "the attainment of industrial peace". If our compulsory arbitration system has achieved its main object this would be powerful justification for its existence and retention.

Dr. Isaac almost closes the second possibility himself when he goes on to discuss other forms of intervention in "national emergency" disputes and the rationale of government intervention in the U.K. and U.S.A. It may be closed completely if we examine the part played by the arbitration authorities in every "national emergency" strike since 1913 for it is not overstating the case to say that they have almost invariably played a very ineffective part. Nearly always settlement has been brought about by direct government intervention. For example, the 1916 coal strike necessitated the formation of a special tribunal under the War Precautions Act. The Commonwealth Arbitration Court had washed its hands of the coal industry earlier in the year and played no part in what was an interstate conflict of extreme severity and gravity. Nor did the State Courts play an effective part except to provide the president of a new special authority. Again in 1917 the infamous "card system" dispute gave rise to 79 strikes in the six States, directly involving 97,500 employees and losing almost 4 million work-days. The Commonwealth Arbitration Court played no part. The N.S.W. Court cancelled the registration of 20 unions involved, but the main brunt of settling the strike fell on the government. The "overtime dispute" on the water-front in 1924, the maritime strike of 1928, the coal strike of 1929 and the timber-workers' strike of 1929, are other relevant examples. The latter was settled at a meeting presided over by the chairman of the Commonwealth Bank

after a previous meeting presided over by the Lord Mayor of Melbourne had been unsuccessful. The Metal Trades dispute of 1937 provides an interesting example of successful defiance of the Court and the Court does not come out well either from a consideration of the events in the Metal Trades dispute of 1947. Major coal strikes of 1940 and 1945 were settled by the Commonwealth Government, and events in the 1940 dispute show the Court in particularly ineffective light. There is plenty of evidence in these examples to dispose of the fear that "national emergency" disputes require a compulsory arbitration system. If conflict reached the proportions of "national emergency" the government would have to deal with it, just as it has had to with most conflicts on this scale.

The first possibility is more difficult to dispose of; it requires searching comparisons of industrial conflict in Australia with that in other industrial nations. The abridged results of such comparisons are set out below. For the purpose of comparison industrial conflict has been defined narrowly as strikes and lock-outs.

International Comparisons of Industrial Conflict

The following table summarizes the results of a comparison of the severity of strikes in Australia and in other countries which seemed most comparable, and where statistics were available. Work-days lost by strikes were taken as a measure of strike severity and brought to a comparable basis using "non-agricultural employees" or "active non-agricultural population" as a common denominator. Comparisons were made from 1913 onwards but could be tightened considerably from 1927, and consequently the table is presented for the 25 years following, from 1927-51. The main object was to determine the rough rank order of the countries listed, using these measures of severity of strikes. Optional adjustments are included in the table to test whether they upset the order of severity established from the total measures. The logic of applying them cumulatively is doubtful, requiring the assumption that strikes caused by trade union organization and security account for the same proportion of days lost by strikes in the mining industry as in other strikes. However, the adjustments may be considered separately and the net figures treated merely as possible measures of closer comparability.

The notes to this table indicate some of the precautions that were taken to make the comparison valid. However, they also show the substantial differences in the component pattern underlying these general averages. For example, with much the same logic the textile industry might have been eliminated as well as the mining industry with the effect of making the Australian position more severe relative to the U.K. and U.S.A. National averages probably obscure much more than they reveal, but from close inspection of the component data and several pilot studies there seem no other adjustments that could affect the order of severity in any other way than to bring Australia higher in it. The Australian compulsory arbitration system has the specific object of reducing industrial conflict and its coverage is almost nation-

TABLE I

Adjusted Comparisons of the Severity of Strikes: 1927-51

Country	Annual Average of Work-days Lost ('000's) per million Non-agricultural Employees				
	Total	Workers Indirectly Involved	Mining Industry	Trade Union Causes	Net
Sweden	884				
U.S.A.	639		− 172	− 131	= 336
Australia ..	602		− 289	− 13	= 301
Canada . ..	278	+ 28	− 71	− 45	= 190
New Zealand .	244		− 71		= 173
U.K.	167		− 53	− 5	= 109

Sources:

Australia—Commonwealth Year Books, Labour Reports and Census Reports.
Canada—Year Book, Census Reports, Annual Supplement to Labour Gazette "Strikes and Lock-outs".
U.K.—Annual Abstract of Statistics, Ministry of Labour Gazette Annual Reports.
U.S.A.—Statistical Abstracts, Monthly Labor Review Annual Reports.
Sweden—I.L.O. Year Book of Labour Statistics, Swedish Yearbook.
New Zealand—Annual Report on Prices, Wages and Labour Statistics.
See also Ross and Irwin, "Strike Experience in Five Countries 1927/1947—an Interpretation", *Industrial and Labor Relations Review,* University of California, Vol. 4, No. 3, pp. 323-42.

Note: (i) The total figures for Sweden have not been taken through the various adjustments because the data were difficult to obtain with any degree of certainty. From Kerr and Siegel it appears that mining and quarrying was the heaviest contributor to total severity, but adjustment for it could hardly have reduced the high Swedish figures enough to change the severity order. On the other hand if the comparison were taken from the Saltsjobaden Agreement of 1938 onwards and excluded the exceptional strike in 1945, Sweden would appear very low in the severity order whatever adjustments were made.

(ii) Most of the countries compared here compile strike statistics on the same basis, namely workers directly involved in strikes plus workers involved indirectly in the establishments where strikes occur. However, in Canada only workers directly involved in strikes are included and an adjustment has been made to allow for this.

(iii) The optional adjustment for the mining industry was calculated because of an implication from several sources that the incidence of mining and waterfront strikes in Australia made severity comparisons unsound. Water transport which contributed on the average only 5 per cent of the time lost by strikes in Australia from 1927 to 1950 may be disregarded, but there was no doubt that mining strikes dominated the Australian statistics. Investigation showed that they have been prominent in other countries also and the adjustment does not affect the order of severity decided from the total figures.

(iv) The optional adjustment calculated for strikes caused by trade union organization and security was included because of the incomplete development of trade unions in U.S.A. and Canada compared with Australia and New Zealand. It may be argued that this component of industrial conflict will disappear as trade union organization develops to maturity and the unions gain acceptance by custom and perhaps by law. However, in a severity comparison which extends back for twenty-five years, it is possible that this component could seriously disturb the comparative position and consequently the adjustment which would have to be made if it were eliminated was included in the table. If this adjustment is applied then Australia moves higher in the severity order than U.S.A., and New Zealand moves up substantially in relation to Canada.

wide. Consequently evaluation on a national basis seems fair and reasonable.

These comparisons support the conclusion that Australia has a greater strike problem than most comparable countries, in spite of an elaborate system of compulsory arbitration evolved and designed to prevent and settle strikes. Does this prove that the Australian compulsory arbitration system has failed in its main task? Ross and Irwin went further than an implied affirmative, and saw the compulsory arbitration system as a cause of high strike severity in Australia: "It has weakened collective bargaining and conciliation without preventing strikes." Oxnam,[3] working rather precariously from an analysis by frequency only of the causes of strikes in Australia, concluded that "the elaborate and comprehensive system of arbitration developed . . . over the past half-century has not succeeded in reducing the number of strikes from any of the causes listed in the official statistics". He was careful to add that this does not prove that arbitration has not reduced the number of strikes which might have occurred in its absence, and saw no way of either proving or disproving such a proposition. The writer submits that the comparisons made above do justify further comment. The fact that other and more industrialized countries without such a system have been less affected by strikes supports the hypothesis that compulsory arbitration in Australia has failed to achieve its main object.

What of New Zealand, which also has a system of compulsory arbitration and which stands much lower in the severity comparisons? Does this prove that it is not compulsory arbitration as a system which has failed but only the constitutional and institutional imperfections of the Australian system? New Zealand has relatively small and scattered industries, and this would allow closer personal relations between employers and employed, a factor which Galenson[4] suggested to explain the relatively low strike figures in Denmark. The induced and sheltered growth of trade unions in New Zealand led Hare[5] to the conclusion that "there are not more than a dozen industries in New Zealand in which unions are capable of deliberate resort to a strike and of maintaining it effectively for more than a short period". Strikes occur usually in single firms, and nation-wide strikes are rare (Hare, p. 255). Weisz[6] doubts the low level of the strike statistics although, in view of the level of strike frequency, his ground for doubt does not seem strong. Certainly the trend since 1940, even excluding the effect of the exceptional waterfront strike in 1951, has been one of increasing severity; and it must be noted that New Zealand cannot match the low figures of the United Kingdom and Sweden in recent years. In

3. D. W. Oxnam, "Strikes in Australia", *Economic Record*, Vol. XXIX, No. 56, 1953, pp. 73-89.

4. W. Galenson, ed., *Comparative Labor Movements*, Prentice-Hall, New York, 1952, p. 141.

5. A. E. C. Hare, *Industrial Relations in New Zealand*, Whitcombe & Tombs, Wellington, 1946.

6. M. Weisz, "An Analysis of Results" (of Compulsory Arbitration), *Industrial and Labor Relations Review*, Cornell University, Vol. 2, No. 1, 1948, p. 105 ff.

Sweden central collective bargaining between strong organizations of employers and employees is supplemented by forceful mediation from the State. In the United Kingdom collective bargaining through customary procedures is the general habit. Little use is made of the voluntary arbitration facilities offered by the State, but there is subtle and persistent mediation when strikes occur.

There is more to be said before a final interpretation of these comparisons. For particular discussion there is Dr. Foenander's suggestion that Australians are more prone to strike than people of other nations which, if true, would vitiate severity comparisons. However, in terms familiar to friends of compulsory arbitration in Australia, "the burden of proof" lies heavily on the system to justify an apparent failure to achieve its main expressed task, and apparent inferiority to other methods and procedures which are much less costly.

Australia: Interstate Comparisons of Industrial Conflict

These regional comparisons were undertaken because the contrasting approaches through wages boards and arbitration courts and the differential development of compulsory arbitration in Australia suggested the possibility of comparison between the States where wages boards had been prominent and those where arbitration court systems, whether State or Federal, had ruled throughout. The differentiation of States on this basis was established with some care.[7] It may be briefly stated here that Victoria and Tasmania should show the full effect, if any, of the wages board approach; N.S.W., Western Australia, Queensland and the Commonwealth represent full development of the arbitration court approach; and South Australia is in an intermediate position with wages boards having retained an effective place in the system alongside the State arbitration court. The growing dominance of the Commonwealth system is seen in all States, but more so in the wages board States, thus perhaps reducing the difference between States in more recent years.

It was necessary to exclude the mining industry from all these regional comparisons, because coal mining, which had produced such a high proportion of strikes in Australia, is located almost wholly in N.S.W., and other mining is also unevenly located.

Apart from this obvious exclusion the regions seem properly comparable. Industry is most developed in N.S.W. and Victoria and they would be most comparable also on a population basis. Queensland and South Australia have smaller populations and less developed industry and they would be fairly comparable. Western Australia is smaller again; and finally there is Tasmania which, because of its very small population and industry, can be brought into the comparisons only with some reservations. Facts of geography and distance may lessen the value of Western Australia and Tasmania for comparative purposes.

Despite these and other limitations, it is certain that these regional comparisons exclude many possibilities of error which may operate in

7. Kelsall, *op. cit.*, pp. 24-5 and 157.

international comparisons. Common methods of collecting and classifying statistical information; common factors of economic and social background; a clear common period of comparison—these are obvious advantages. For this reason it was thought that any evidence from these comparisons within Australia would be particularly valuable to check or confirm some of the conclusions suggested by the more difficult and precarious international comparisons. In the international comparisons general averages were used only to establish and test a rank order on strike severity for the nations studied; and it has been emphasized that such general averages should be viewed with the utmost caution. The regional comparisons within Australia offer firmer ground for the calculation and the use of general averages and semi-averages over the common period since 1913 when the statistics of strikes were first compiled.

Comparisons of the average severity of strikes per annum for the six Australian States from 1913 to 1952 are set out in the table below:

TABLE II

Australia: Interstate Comparisons of Strike Severity 1913-52
(excluding the Mining Industry)

State	Work-days lost per 100 industrial employees (annual average)
New South Wales	68
Victoria	49
Queensland	(69/72)*
South Australia	(34/36)*
Western Australia	68
Tasmania	(20/32)*

Notes: "Industrial employees"—the basis used for equating these measures—was total number of employees less those engaged in primary production, mining, amusements, personal and domestic and professional groups as per census figures for 1911, 1921 and 1933 interpolating for the years between each census. From 1939 direct measures were available (from Labour Reports) for wage and salary earners excluding rural, female domestics, defence forces, etc. The slight change in basis during the period is not important as it was possible to maintain strict comparability between States on each basis.

* The bracketed figures represent estimates derived from two methods of calculating annual averages where there were instances of "nil" strikes in one or more years during the period. The calculations agree fairly closely except in the case of Tasmania, which has already been noted as being brought into the comparison with reservations.

Sources: Raw figures from which these calculations were made were obtained from Commonwealth Labour Reports from 1913 to 1952, and Census Reports for 1911, 1921, 1933 and 1947.

This severity comparison is highly interesting and relevant. On the face of it the wages board States Victoria and Tasmania have suffered much less from strikes than the arbitration court States. Individual comparison between Victoria and N.S.W. as closely comparable in population and industrial development highlights the difference. South Australia, with a much smaller population and industry, does

not seriously disturb the results although wages boards have been only part of the system there. Comparison of South Australia with Queensland and Western Australia, between which it would fall in an order of population size and industrial development, shows a striking difference. The hypothesis which was suggested by the international comparisons, namely that compulsory arbitration in Australia has failed in its main task of preventing strikes, is strongly confirmed by these results.

Not only is the confirmation direct but it comes in a form which dispels a substantial logical doubt about the international comparisons. Oxnam felt able to conclude that arbitration in Australia had not succeeded in reducing the number of strikes from any of the causes listed in the official statistics. He expressly excluded the possibility of reasoning that arbitration has not reduced the number of strikes which might have occurred without it. Foenander, when faced by a table of strike severity which did not agree with his main thesis, implied (Note 2) that Australian wage-earners are more organized and spirited in asserting themselves, or in other words are more likely to strike than those in other communities.[8] Forchheimer suggested workers involved in strikes as a measure of strike proneness; and although his reasoning is very much open to doubt, Australia ranks very high against his comparisons.[9] These lines of thought all tend to the possibility that Australians are more strike-prone than people in other nations, which if it were true would weaken the conclusion suggested by the international comparisons.

The comparisons made within Australia are free from possible international differences in strike proneness. This strong confirmation of the hypothesis that compulsory arbitration has failed in its main task of preventing strikes indirectly strengthens the evidence from international comparisons as well as providing its own quota.

Conclusions

Dr. Isaac's adverse comparison of compulsory arbitration with collective bargaining chimed to a considerable extent with an analysis of the development and workings of our arbitration system made in the research already referred to, which revealed notable inherent or engrained deficiencies.[10]

The acid test is provided by the foregoing comparisons of the severity of strikes in Australia with that in other industrial nations. From this the hypothesis that the Australian compulsory arbitration system has failed in its main task may be strongly established and this is confirmed by the regional comparisons within Australia.

The argument is not weakened by the comparatively low figures of strike severity in Australia during the years since those included in

8. O. de R. Foenander, *Solving Labour Problems in Australia*, Melbourne University Press, 1941, esp. p. 6 and note 2.

9. K. Forchheimer, "Some International Aspects of the Strike Movement", *Oxford University Institute of Statistics Bulletin*, No. 10, January 1948, pp. 9-18.

10. Kelsall, *op. cit.*, pp. 153 ff.

the calculations above although there has been a tendency to be complacent about industrial conflict in Australia during recent years. The Department of Labour Pamphlet *Industrial Disputes in Australia* published in 1958 shows (Table L) that we remain above Britain and the Scandinavian countries in comparative measures of strike severity.

Taken together the evidence provokes the conclusion that the Australian compulsory arbitration system has failed to reduce industrial conflict and has made no discernible contribution to goodwill in industry. As Dr. Isaac has shown there seem less costly and more palatable alternatives available.

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WORKERS' OPINIONS ON COMPULSORY ARBITRATION

In his recent article Dr. J. E. Isaac comments on the prospects for collective bargaining in Australia.[1] A survey of workers' opinions in Western Australia was conducted in the latter part of 1958. The sample consisted of 50 skilled men in the metal trades and they were asked, among other things, their opinion of compulsory arbitration. Two-thirds of the workers replied with some form of approval although the degree of enthusiasm varied from "I suppose it's all right" to "Excellent. A wonderful idea. The workers owe nearly everything they've got to arbitration." A significant number (14 per cent) thought the Court was biased in favour of the employers and a number of them connected this with a particular president in terms such as "D——— was all right but J——— is definitely an employer's man." A tenth of the respondents criticized the Court for being too slow.

Just over half the sample could make no suggestions as to how the arbitration system could be improved. The other half made varying comments but the most frequent ones were that the Court's operafitter said, "I think that legal counsel should be barred. This would speed up the proceedings and cut the costs. The Court does more for tions should be speeded up and that costs should be reduced. One the lawyers than the union."

Over half the sample thought that the unions would be worse off under collective bargaining and the main reason for this was that they feared the economic strength of the employers. A typical reply was, "It might work all right in America but it wouldn't work here. The employers are too strong for us financially. The workers have always needed arbitration to protect them and they still do." Another 20 per cent qualified their answer along the general lines that it would be satisfactory for the strong unions but that the weaker ones would suffer. The remaining 26 per cent were in favour of collective bargaining, mainly because they saw it as a way in which the unions could escape from their ties with the Australian Labor Party.

Economic Record, 34, 1958, 347-61.

1. J. E. Isaac, "The Prospects for Collective Bargaining in Australia",

This survey, obviously, covers only a very small proportion of the work force and tells us nothing of the opposition or otherwise of the trade unions as institutions to any attempt to remove the protective cloak of the arbitration system. But it does indicate that there would be considerable opposition from the rank and file.

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MIGRATION AND THE AUSTRALIAN WORK FORCE

In a recent article in this journal, H. P. Brown writes with regard to the post-war years: "Moreover, without migration, it appears probable that the female work force would have shown little, if any, growth."[1] This statement is only true with regard to what the author calls the "available work force", based on the work participation rates for each age group observed in 1954; and this concept has little relevance for the female population. However, for the intercensal period 1947-54 it is possible to estimate the contribution made by male and female immigrants to the actual work force. It can be seen that immigration accounted for the major part of the growth of the female work force, but its role was less predominant in this respect than in promoting the growth of the male work force.

In the first place, the 1954 census shows that there were at least 390,000 males and 275,000 females in Australia who had been born outside the country and had been resident for under seven years. Allowing for a proportion of those immigrants whose length of residence was not stated, the numbers become 396,000 and 279,000 respectively. Furthermore, Ruth Dedman has estimated that about 64,000 children were born to these recent immigrants during the intercensal period;[2] about 33,000 of these would be males and 31,000 females. This leads to the following result:

TABLE I

Analysis of Changes in Size of Total Population, 1947-54

	Males (thousands)	Females (thousands)
Population, 1947	3,797	3,782
Changes due to causes other than immigration	+320	+348
Population, 1954, without immigration	4,117	4,130
Changes due to immigration	+429	+310
Actual population, 1954	4,546	4,440

The age distribution of the recent immigrants is given in the 1954 Census. If the work participation rates in each age group had been

1. H. P. Brown, "The Australian Male Work Force", *Economic Record*, Vol. 35, No. 70, April 1959, pp. 89 and 92.
2. W. D. Borrie and Ruth M. Dedman, *Population Increase and Decrease 1947-1954*, Department of National Development, Canberra, 1958, p. 5.

the same as those for the population as a whole, they would have added 305,000 males and 66,000 females to the work force. However, this assumption would not be realistic as far as the female sector is concerned.

It is known from the 1954 Census that about 567,000 males and 133,000 females born outside Australia were in the work force at that date. If the work participation rates for each sex and age group are applied to the persons born outside Australia, the expected number in the work force would also be 567,000 males but only 107,000 females. There is thus an excess of 26,000 immigrant females at work, which may be assumed to be proportionately distributed over the various age groups. The marital status composition of the population born outside Australia is not tabulated, but it could hardly be supposed that there would be an excess of single women among them which could account for the higher work participation rate.

Separate work force data for persons resident under seven years, and those born abroad but resident for seven years or more, are not available; but two alternative assumptions are: (a) that both groups have the same work participation rate in each age group; (b) that the second group has the same work participation rate in each age group as persons born here. Both assumptions lead to the same result for males; for females, they provide extremes, between which the true figure may be reasonably assumed to be. The result is that 305,000 of the 567,000 male workers born outside Australia had immigrated between 1947 and 1954, while between 76,000 and 89,000 out of the 133,000 female workers born outside Australia had done so. The implications of this result may be gathered from the following tabulation:

TABLE II

Analysis of Changes in Size of Work Force, 1947-54

	Males	Females	
	(thousands)	Assumption (a) (thousands)	Assumption (b) (thousands)
Work force, 1947	2,479	717	717
Changes due to causes other than immigration	+73	+52	+39
Work force, 1954, without immigration	2,552	769	756
Changes due to immigration ..	+305	+76	+89
Actual work force, 1954 ..	2,857	845	845

Thus, immigration appears to have been responsible for about four-fifths of the growth of the male work force, and for between three-fifths and seven-tenths of the growth of the female work force between 1947 and 1954. To put it differently, the proportion of all males who are in the work force would have fallen from 65·3 per cent to 62·0 per cent in the absence of immigration, instead of merely falling to 62·8 per cent; the proportion of all females in the work force would have fallen from 19·0 per cent to somewhere between 18·3 per cent and

18·6 per cent without immigration, instead of remaining virtually constant.

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INFLATION AND COMPANY FINANCE

The major contention advanced by Professor Mathews and Mr. Grant in this book[1] is that over the eight years 1945-46 to 1952-53 non-rural prices and retained profits were not raised rapidly enough. The consequences were that the financial position of individual businesses was weakened and that for the economy as a whole there was a tendency towards instability, an inefficient allocation of resources and an undesirable distribution of income.

In the authors' view, a large part of the responsibility for this state of affairs must be attributed to the accounting profession, because the information they furnished to managements was based on historical money values and therefore misleading in a period of steadily rising prices. What accountants should do when preparing profit and loss accounts and balance sheets is to value stocks at the beginning of the period at the prices ruling at the end of the period, transferring the difference between this value and the stock figure in the previous balance sheet to a special reserve. They should also calculate the allocation to the depreciation reserve on the basis of the current year's replacement cost of each asset.

The authors' advice to business managements is that they should set the prices of what they sell on the basis of replacement rather than historical or incurred costs, and that before distributing profits they should first make the allocations to reserves described in the preceding paragraph. A considerable part of the book is concerned with demonstrating to what extent managements fell short of following this advice during these eight years.

1. *The Figures*

The evidence put forward is mainly derived from an analysis of the estimates of company profits contained in the national income white paper, adjusted to exclude life assurance companies—the figures already exclude the profits of banks. On the basis of this and other data, mainly drawn from the annual reports of the Commissioner of Taxation,[2] three major conclusions are reached:

(1) that companies were forced into excessive borrowing;
(2) that retained profits, over and above what should have been set aside in depreciation and stock appreciation reserves, were inadequate; and

1. *Inflation and Company Finance.* By Russell Mathews and John Grant. (Law Book Co. of A/asia, Sydney, 1958.) Pp. 179. 42/- Aust.
2. It is this reliance on data derived from income tax tabulations that explains why the analysis stops at 1952-53.

(3) that overall profits were too low in relation to current replacement costs of fixed assets and stocks.

The first step in the statistical analysis is to deduct from profits the estimated amount of income tax and dividends attributable to each year's operations—as distinct from the national income estimates of the amounts paid each year—to arrive at undistributed profits. The authors add on depreciation allowances, new money raised by share issues by "listed" companies and the increase in tax and dividend provisions. By taking the difference between this total and expenditure on capital formation, they arrive at an estimate of other net borrowing (or lending) by companies other than banks and life assurance companies.[3] Their conclusion from these figures is as follows (p. 44): "It is significant that companies were forced to borrow throughout most of the period in order to finance investment in stocks and fixed assets. This more than anything else indicates the inherent weakening of their financial position."

The authors' estimates show capital formation over the eight years totalling £1,510 million. No less than £1,114 million of this was financed from internal sources,[4] £250 million from new share issues by "listed" companies and £146 million from net borrowing. No figures are available of new money raised by share issues by "unlisted" companies over this period, but in the three years ended June 1957 it amounted to 55 per cent of new money raised by share issues by "listed" companies. If this ratio also held good in the earlier years, new share issues by "unlisted" companies could have raised £130 million, so that it is quite possible that net borrowing by companies in the eight years to June 1953 was negligible. In any case, it is hard to accept these figures as evidence of financial strain or weakness.

Mathews and Grant next proceed to estimate the magnitude of the allocations to reserves that, in their view, should be deducted to arrive at companies' net "savings". The recalculation of depreciation allocations on the basis of current replacement costs yields a figure of £335 million, which is in fact £2 million short of depreciation already deducted from company profits; the latter includes the effect of initial allowances during these eight years. However, the allocation to stock appreciation reserves is estimated at £467 million. Deduction of these amounts, and the increased tax and dividend provisions referred to in footnote 4, from internal sources of funds (£1,114 million) yields the authors' estimate of current "savings" of £194 million. On the basis of these calculations the authors reach their second major conclusion, that the policies followed by managements did not result in

3. The authors appear to understate net borrowing by £31 million over the eight years covered, because they include buildings in the assets on which depreciation allowances are calculated—see page 41. Not being an allowable deduction for taxation purposes, these would already be included in the estimate of undistributed company profits.

4. This figure includes £118 million increase in tax and dividend provisions, which the authors argue on p. 35 should be regarded as borrowing, presumably from tax revenue and shareholders. Apart from conceptual difficulties, these liabilities do not fall due in the current year.

"general reserves [of a size] necessary to guard against unforeseen contingencies" (page 130).

In fact, contingencies of a kind that resulted in companies drawing on past "savings" occurred only once—1951-52—in these eight years and then only to an extent (£41 million) that was covered by the "savings" of the two preceding years. In the following year "savings" recovered to £83 million. It is, once again, difficult to agree with the authors that net "savings" of £194 million in the eight post-war years, after setting aside depreciation and stock appreciation reserves and making full provision for tax and dividend payments in the following year, constitute evidence of financial weakness.[5]

Similar calculations carried out on data obtained by Mathews and Grant from twenty South Australian public companies show capital formation of £13·6 million, financed from internal sources to the extent of £6·5 million, with £3·9 million from new share and debenture issues and £3·2 million from net borrowing. Net "savings" by these companies was negative, £0·2 million, made up as follows:

	£'000	£'000
Disclosed undistributed profits		2,800
Secret reserves concealed in depreciation reserves	817	
Less Depreciation adjustment	—576	241
Other secret reserves		272
		3,313
Less Allocation to stock appreciation reserve		—3,480
Total		— 167

In addition, increased tax and dividend provisions amounted to £1·1 million, and the stated transfers to secret reserves were thought by the authors to be underestimated (pp. 114-127).

In their final set of statistical calculations, the authors revalue at the current prices of each year fixed assets and stocks of Australian trading companies to obtain what they call "current funds employed". Profits, after deducting the allocations to depreciation and stock appreciation reserves already explained, are shown to have fallen as a percentage of "current funds employed". This fall is put forward as evidence that management did not do as well as they should have done on the authors' criteria—see pp. 146-9. Had profits maintained the same percentage of "current funds employed" that was enjoyed on average in 1945-46 and 1946-47, they would have been £281 million, or 17 per cent, higher than they actually were. However, of this amount no less than £217 million is attributable to 1951-52 and 1952-53, years

5. The authors do not look to retained profits as a significant source of finance for expansion (p. 132): "In general, national economic interests would seem to be best served by a policy of distributing current income to the fullest possible extent that is consistent with the requirements set out above. The financing of economic expansion may then be left to individual investors and the mechanism of the capital market."

in which prices generally continued to rise but there was something of a recession.

2. *Company Policies*

Which particular management decisions were responsible for what Mathews and Grant regard as the unsatisfactory financial outcome of company operations during these eight years? Clearly these decisions must have concerned either the amounts distributed as dividends, the amounts paid as taxation or the overall level of profits.

Their conclusion on dividends declared is as follows (p. 39): "Restraint in dividend policy was one of the most significant features of Australian company finance during the postwar period." Dividends payable in 1948-49 and 1952-53 were the same percentage of company profits, adjusted for initial depreciation allowances, as in the average of 1945-46 and 1946-47, with somewhat lower percentages in the other four years of the period.

On taxation, the authors assert that allocations to depreciation and stock appreciation reserves should be excluded from taxable income, but emphasize that this need not mean lower total revenue from company taxation. "For purposes of argument it should be assumed that changes in the tax base would be accompanied by changes in rates designed to maintain the aggregate yield of company taxes" (p. 133). On their own figures, and assuming that other things remained unchanged, this assumption would mean average rates of income tax on company profits (as defined by Mathews and Grant) in excess of 60 per cent in 1950-51 and 1951-52. The incidence of taxation between companies would, of course, be very different when prices were rising.

But the burden of the argument is that other things should not have remained unchanged. "Given the level of taxes and dividends which prevailed, to increase the rate of current saving it would have been necessary for company profits (and current incomes) to have been substantially larger than in fact they were. . . . The main reason for this decline in earning power appears to have been inappropriate pricing policy. . . . Prices must be related to current replacement costs if profitability in current terms is to be maintained" (pp. 168-9).

3. *Accounting Conventions and Management Action*

We have now traversed briefly the arguments by which Mathews and Grant reach their conclusion that company managements did not raise their prices sufficiently rapidly and thereby suffered from too low a level of retained profits. As already indicated, the evidence that profits were too low is, in my view, not very convincing. Companies in fact financed a high and rising level of investment with relatively little recourse to outside funds. Most of the short-fall in profit from the authors' own criteria of what should have been achieved occurred in the years 1951-52 and 1952-53.

In short, the criticisms of management action are considerably stronger than the statistical evidence warrants. Companies did very much better than the theoretical sections of the book suggest. It seems

to me that one possible explanation of this degree of inconsistency is that an important purpose of the book is to pursue an argument with the accounting profession about the meaning to be attached to accounts based on incurred or historical costs. It appears that the authors set out to show the accountants the error of their ways by this analysis of actual experience. However, this meant assuming that business action follows the accountancy textbooks. This assumption is clearly implied in the following quotation from page 2: "The statistical analysis carried out in this book throws light on the extent to which inflation has changed the profitability or earning power of companies and the pattern of their financial structures, primary emphasis being placed on what we call the accounting effects of inflation—the effects which result from the procedures conventionally used by accountants."

In fact, the book itself is full of evidence that management action is not guided by textbook accounting. This is certainly true of what managements publish about profits (pp. 112-119) and of their actions on dividends. Further, it is probably unfair to judge the accountants by the textbooks. We do not know what advice they give managements —public statements by professional associations are another matter altogether. The authors appear to assume that the statistics of profits based on income tax returns represent the figures that accountants hand to managements; this, too, is probably unfair. There is still less basis for suggesting that the conventions reflected in income tax returns guide accountants in furnishing advice to be used in setting prices.

The crux of the argument about the general level of profits is the way in which managements (including all potential competitors) determine their prices. The indirect evidence which Mathews and Grant are able to muster as to whether managements think in terms of historical or replacement costs (pp. 150-4) is inconclusive, as they admit. As we are unable to sit around and diagnose decisions as they are taken, we are largely dependent on analysis of the resulting outcome in profits. But in any case, the procedures described by the authors as "pricing policies" (i.e. the addition of absolute or percentage margins to either historical or replacement costs) tell us little about what determines prices; they merely reformulate the question in terms of how and why these margins vary, from product to product, and from time to time with differing economic circumstances.

In an expanding economy are not the costs of an actual or potential new entrant or new plant more relevant to prices than what the accountant says about the costs he associates with the use of existing capacity or existing stocks? To the extent that this is true, prices do reflect current replacement costs.

A similar confusion between accounting conventions and what actually happens is evident in the authors' contention that one reason for the unsatisfactory level of profits was that managements paid insufficient attention to raising efficiency. But why would an overall increase in managerial efficiency (in a closed economy) benefit only, or even mainly, retained profits?

4. *The Question of Principle*

What I have suggested is that the statistical evidence fails to bear out the authors' predictions of the serious consequences of textbook accounting conventions in a period of inflation, and that this is because these conventions do not determine company actions. The authors' contentions, in Chapter II and elsewhere, that "additional funds must be obtained from external sources in order to prevent the scale of operations from running down" (p. 167) or that trading enterprises "must hand over portion of their income-earning assets to the taxation authorities" (p. 136) would hold only if prices were based on historical costs and if the resulting level of profits, calculated on historical costs, was fully distributed.

There remains for discussion the question of principle—what are the grounds for arguing that in a period of inflation businesses should be enabled, by some means or other, to obtain much higher profits? Mathews and Grant dispute the view that theirs is simply another scheme for protecting one group of income recipients from any adverse effects from rising prices, on a par with arguments addressed, say to bond holders: that they should avoid money illusions and sell bonds if the interest return after deducting the deterioration in real capital value is too low; or to wage-earners: that they should not accept wages that do not rise as fast as prices. The authors argue that they are concerned only that companies are in a position to replace real assets from retained profits; see, for example, page 23: "The wider question of avoiding losses in purchasing power arising from inflation, which affects persons and financial enterprises as well as trading enterprises, is not an accounting problem. If trading enterprises make the adjustments we have recommended in respect of stock appreciation and depreciation they will derive a measure of current income equivalent to the unadjusted incomes of persons and financial enterprises, which are already expressed in current terms."

However, as outlined above, Mathews and Grant argue that current income (i.e. profits after deducting the adjustments and before deducting taxes and dividends) as a percentage of current funds employed (i.e. with real assets revalued in current prices) should have remained constant. With the absolute amount of taxes and dividends unchanged, this would have meant retained profits rising faster than prices—from £31 million in 1945-46 to £166 million in 1952-53.

The group in the economy most likely to suffer from price increases (ignoring, as do the authors, that ours is not a closed economy) is the individual saver, because it is not easy to find alternatives to bank deposits, bonds, or claims on insurance companies or pension funds. The sector which holds most of its assets in goods, and can raise its income by raising prices, should be well-placed to hold its own. The authors' thesis that this sector was misled by its accountants into not doing so is, in my view, not sustained.

In other words, I disagree with the authors that adoption by company accountants of the procedures recommended in this book would

have resulted in higher prices and higher retained profits. The case put forward that companies should earn a constant rate of profit on "current funds employed" has no greater validity than other schemes designed to shield particular groups in the economy from any adverse effects of rising prices.

Conclusion

Although the authors' views about the influence of accounting conventions on company operations may be open to doubt, their plea for company accounts that present a truthful reflection of company results, and for the publication of such accounts, is very welcome. They comment caustically on the discrepancies between published and actual profits (Chapter 8) and characterize the creation of secret reserves, by overstating depreciation or under-valuing closing stocks, as nothing less than "financial manipulation" (p. 6). They point out that unless these procedures are carried out cumulatively, the understatement of profits one year will be accompanied by overstatement in subsequent years.

Indeed, I have the feeling that, at heart, Mathews and Grant are less concerned to see prices rise more rapidly than with the creation of a climate of opinion in which the publication of actual company results would be acceptable, with retained profits stated accurately and allocated realistically to stock appreciation and depreciation reserves. Clearly they believe that accountants have a much greater responsibility in this respect than the profession itself would, as yet, accept.

Full disclosure on these lines would also serve the purpose of bringing out differences between industries both in actual rates of profit and in the relative importance of stock appreciation. The authors argue strongly that present practice has distorted the allocation of resources between industries. Although the results did not lead to any broad generalizations about resource allocation, the presentation of the data and calculations by industry groups was obviously a lengthy task and may prove useful to those working in this field. The statistical sections of the book are a model of presentation: sources of data, and the calculations performed, are set out in commendable detail. The scope for possible errors is listed and comparisons with methods used elsewhere for similar purposes are furnished.

R. J. CAMERON

Canberra.

INFLATION AND COMPANY FINANCE: A COMMENT

The essential point of the argument about the insufficiency of historic cost depreciation to meet the replacement cost of assets is stated by Professor Mathews and Mr. Grant when they write: "Ideally the depreciation charge should maintain intact the real capital resources, or productive capacity of the enterprise."[1] Once having made

1. R. L. Mathews and J. McB. Grant, *Inflation and Company Finance*, Law Book Co., 1958.

this statement, they do not examine further its implications. The remainder of the book is devoted to a discussion of the methods of estimating the replacement cost of an asset and the inefficiency arising through the use of historic cost depreciation during periods of fluctuating prices. There is a great difference between maintaining the productive capacity of an *enterprise* and measuring the replacement cost of an *asset*.

Although Domar's article upon replacement and depreciation is mentioned, its significance seems to have been overlooked.[2] One of the conclusions in Domar's work was the possibility, for a growing company, that annual depreciation allocations would be well in excess of annual replacement requirements. This difference between replacement and depreciation follows from the fact that, in a growing company, annual depreciation charges will be rising with the expanding annual investment outlays whereas annual replacement charges will reflect the lower investment expenditure some years in the past. The margin between annual replacement charges and annual depreciation allowances would be removed only by substantial annual price rises. The total depreciation sums available to an enterprise at any time may be more than sufficient to meet replacement charges. The stress is placed upon the role of the enterprise rather than the position of each asset. Thus even though the depreciation allowance for the individual asset may be insufficient to meet the costs of replacement at the end of the useful life of that asset, the productive capacity of the enterprise may be in no way impaired despite the existence of price rises.

Other grounds can be found for questioning the adequacy of the arguments put forward by Mathews and Grant in favour of replacement cost depreciation. Annual depreciation allowances are accumulated in advance of replacement needs and such "excess" sums are retained to finance the operations of the company. But enterprise does not seem to allow for the profitability of these depreciation reserves when assessing annual appropriations for depreciation. Yet there seem to be good grounds for allocating each year an additional sum, over and above ordinary depreciation charges, representing the interest earned on depreciation reserves. If the companies did not have these depreciation reserves, they would be forced to obtain additional capital so as to maintain the same scale of operations. In all likelihood a dividend or interest payment would have to be made on the additional capital. Therefore, it seems appropriate that an estimate of the profit accruing on depreciation reserves be included in the overall depreciation allowance each year. If this were done, the total sum accruing at the end of the life of an asset might be much greater than the original cost. The plain fact is that depreciation is a very important contributor to the total funds available to enterprise.[3]

A disturbing feature is the basis used by Mathews and Grant for estimating the replacement cost of assets. The method adopted in the

2. E. D. Domar, "Depreciation, Replacement and Growth", *Economic Journal*, March 1953.

3. Commonwealth Bank, *Statistical Bulletin*, Company Supplement, November 1958.

book is to adjust the original cost of assets by applying an index for changes in the price of plant and machinery. Once the possibilities of technical progress are admitted, the suitability of adjusting with a straightforward price index can be questioned. If the fruits of technical progress are revealed in an increased output from a new machine costing much the same as the old one, the connection between a replacement cost valuation and an adjustment to the original cost by means of a price index is severed.

Although Mr. Cameron has examined fully the nature of the statistical material presented by Mathews and Grant, one feature of the investigations into the twenty South Australian companies might be further considered. These companies do not seem to have been impelled by any sense of urgency to record claims for higher depreciation allowances. In Table VIII-5 the difference between the total amount of the initial depreciation allowances claimed for tax purposes and the actual amount recorded in accounts is disclosed. Between 1945-6 and 1951-2 initial allowances approved by the taxation authority amounted to £904 millions whereas the sum recorded in accounts was £365 millions; a staggering difference of some £540 millions. Yet it must be admitted that in the subsequent Table VIII-6 we find the creation of "secret" reserves, other than the initial allowances recorded in company accounts, amounting to £533 millions over the same period. Of this latter total some £243 millions was allocated in 1951-2. At the very least, these marked differences in the methods of allocating depreciation and "secret" reserves should have produced a fuller discussion than that accorded by the authors. Two questions come to mind. First, are companies opposed to disclosures of the full extent to which they can take advantage of depreciation allowances because of the possibility that large depreciation reserves might lead to a reassessment of the meaning of depreciation charges? Secondly, does the rise in secret reserves suggest that, by one means or another, companies endeavour to make financial provision for future replacement needs so far as their competitive position permits, and regardless of views about depreciation policy?

The authors condemn various devices, characterized as financial manipulation, by which actual and published profits of companies are made to differ so markedly. They would claim that their replacement cost depreciation approach provides the only efficient method of analysing company results. As replacement values are not known in advance, the authors say "... the only practicable alternative would be to make the depreciation charge in any period equal to the sum of the following:

(a) depreciation based upon the current replacement value of the asset; plus

(b) the amount by which previous depreciation charges, based upon the lower replacement values prevailing in previous periods, have been insufficient to provide for replacement on the basis of current values.[4]

4. Mathews and Grant, *ibid.*, pp. 11-12.

But (b) is rejected on the argument that it would distort a measure of current income which is supposed to be current income less current costs. However, the measure of replacement cost depreciation is thereby distorted and no longer represents what is claimed for it.

Mr. Cameron seems to offer a favourable interpretation of the purpose of this book. He claims that Mathews and Grant are really seeking to create a climate favourable to the presentation of accurate company accounts. The main purpose of the book is to put forward proposals for replacement cost depreciation and surely there are many other arguments than this for providing satisfactory company accounts. The arguments in favour of the change fall down, to a large extent, because insufficient attention is paid to the theoretical analysis of depreciation and the possibility of prices being demand rather than cost determined.

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NEWS AND NOTES

Sir Donald McDougall, fellow of Nuffield College, Oxford, has arrived in Canberra to take up the Visiting Chair in Economics and Finance at the Australian National University. He will stay until the end of the year.

Professor A. W. Phillips, Tooke Professor of Economics and Statistics at London School of Economics, is spending five months in Australia, with the University of Melbourne and the Commonwealth Bank.

Sir Alexander Carr-Saunders has returned to England after six months as Visiting Professor attached to the Research School of Social Sciences at the Australian National University.

Sir Sydney Caine, Director of the London School of Economics, has been visiting Australian universities under the auspices of the Commonwealth Relations Office.

Professor W. H. B. Court, Professor of Economic History at the University of Birmingham, will be Visiting Fellow attached to the Department of Economics at the Australian National University until the end of this year.

Canterbury Agricultural College has recently created a Chair of Agricultural Economics, and the first occupant of this Chair is Dr. B. P. Philpott, formerly statistician with the N.Z. Meat and Wool Board's Economic Service.

The Melbourne University Press is anxious to obtain copies of the following issues and supplements of *The Economic Record* for which it is offering 15/- each:

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REVIEWS

The Australian Wool Market, 1840-1900. By ALAN BARNARD. (Melbourne University Press on behalf of the Australian National University, 1958.) Pp. xii + 231. 35/- Aust.

The outstanding place of wool in the Australian economy in the nineteenth century, arising from its leading position as an export commodity, is emphasized by Dr. Barnard. In this period, 1840-1900, Australia became "the world's largest exporter of merino wool and a dominant force in the world wool markets". The writer shows how the growth of a large highly profitable export industry encouraged a related growth of services not only in the form of transport and personal services, but also the highly specialized banking and marketing agencies.

The book is arranged in three parts. The first provides an admirable sketch of the expansion of the pastoral industry, the changes in the technology of production and the increasing capitalization of the industry that began in the 'seventies. Here are examined the changing pattern of consumption of Australian wool (associated with changes in the structure of the manufacturing industries) and its influence both upon the prices paid for colonial wools and upon the organization of the market. The expansion of the Australian wool output—with that of other new countries—is shown as being made possible up to the 'sixties by the growing demand for wool implicit in mechanization of the woollen industry. After the 'sixties, Dr. Barnard claims, continued expansion in the woollen industry was made possible in part by the inflow to Europe and North America of cheap antipodean wools.

Part Two is the main section of the study: the institutions of the market. It examines in detail the development of the marketing process which served to link the Australian colonial producer with the European and American buyer. The pattern of marketing emerges: in the colonies and overseas in the earlier years, later centralized in London, and eventually relocated in Australia.

"Wool," we are reminded, "is not a homogeneous commodity. . . . Australian wool is simply a shorthand way of referring to a number of types of wool, the composition of which changed during the nineteenth century." A short account is given of the changes in the production of Australian wool, and the varieties which were developed. These met the requirements of different types of manufacture and were therefore subject to different conditions of demand.

The commodity for which Dr. Barnard is examining the market "was in fact a group of products that changed over time. In the 'forties it consisted primarily of clothing merino wool which was washed or scoured. This was supplemented and later overshadowed by merino combing wool, obtained by introducing foreign merino strains into the Australian flocks. Towards the end of the century long-woolled sheep, crossbreds and comebacks began to increase their relative num-

bers and to add increasing quantities of their distinctive wool to the Australian output. There was, finally, a general change from scoured and washed to greasy wool."

The short concluding Part Three, not very happily entitled, "The Product of the Operations of the Market", deals critically with problems of marketing costs and the data available to show price movements. The analysis of marketing costs and of wool price movements and the conclusions drawn are of special interest in a consideration of investment in the wool industry and the crisis of the 'nineties.

The book as well as being documented in detail is provided with a select bibliography. It has a valuable statistical appendix and an interesting series of plates reproducing contemporary illustrations.

This volume is a welcome addition to the specialized studies in economic history that are providing us with more adequate, critical and well-based accounts of particular aspects of the economic development of this country. The study has been enriched by the author being able to draw upon the business and other records of a number of firms, both in England and Australia, engaged in the wool trade.

M. HARRIS

University of Western Australia.

Australian Banking (Third Edition). By J. K. GIFFORD, J. VIVIAN WOOD and A. J. REITSMA. (University of Queensland Press.) Pp. xvi + 297. Price not stated.

This third edition of *Australian Banking* comes three years after the second, and contains relatively few changes.

The book has been "expanded" to five parts by the addition of a new Part III on "The Busines of the Savings Banks". There is certainly need for a study of savings banks: they are major lenders for home building and large bond-holders, and movements in their liquidity ratios influence the liquidity of the trading banks. The development of the private savings banks must have raised new problems for the Central Bank. This new Part III raises none of these problems; it comprises three pages of descriptive material. It is difficult to see any reason for creating this diminutive Part III. The balance of the book would have been better preserved by including it in Part I as a separate chapter.

There is a brief discussion of the new banking legislation, which is commended for several good reasons, but the argument on p. 188 that it removes the possibility of the trading banks being driven out of business by calling up special accounts is untenable. Should any government wish to eliminate the private banks under the new legislation, it could do so simply by raising the statutory reserve deposit ratio high enough.

On monetary theory, the misleading discussion of earlier editions has not been corrected. The analysis of inflation in terms of velocity of circulation will either tell the layman nothing or be positively mis-

leading. Consider for example: "We must conclude that the rise in the price level from 1939 to the present was *inflationary*, due to an increase in the amount of money spent, the latter being due to an *inflation* of the money supply" (p. 131, italics as in text). In Part V, a useful summary of the European Common Market has been added.

R. WALLACE

University of Adelaide.

Minerals in the Development of Australia. (*Economic Papers* No. 12.) (Economic Society of Australia and New Zealand, N.S.W. Branch, Sydney.) Pp. 94.

This volume contains the four papers presented to the 1958 Winter School of the New South Wales Branch of the Economic Society of Australia and New Zealand. The introductory paper by Dr. J. A. Dunn discusses the likely development of each of Australia's principal mining industries during the next 10-20 years. Dr. Dunn strikes a generally optimistic note—for example, he anticipates that Australian producers will at least maintain their present share of expanding world markets for lead, zinc, and copper. These and other forecasts in the paper are based on the assumption of "an open market" for these metals. If the term "open market" is taken to refer to a situation in which no tariffs and quotas are imposed by the principal net importing regions, no subsidies are being paid to metal producers in other exporting countries, and no international price stabilization schemes are operative, the assumption is one which we may be inclined to question.

A paper by Mr. D. J. Hibberd considers the nature of the planning problems facing a metalliferous mining concern contemplating operations in a remote region of Australia. The considerable initial investment in mining projects of this kind is only partly directed to plant and equipment for extraction and treatment of the ore. A large proportion of the capital is required for the provision of transport facilities, housing, and public utility services of all kinds.

Dr. H. F. Bell discusses the likely impact on the Australian economy of a continued expansion in the mineral industry. There seems little doubt that the bulk of the capital to finance this expansion will be provided by further direct investment by overseas mining interests.

B. L. JOHNS

University of New South Wales.

Land Utilization in Australia. (Third Edition.) By SIR SAMUEL WADHAM, R. KENT WILSON and JOYCE WOOD. (Melbourne University Press, 1957.) Pp. xxii + 344. 40/- Aust.

This is the third time that this book has been reviewed in the pages of this journal. Commenting on the second edition in *The Economic Record* in 1951 Sir John Crawford said that it "remains the best single standard work and introduction to land use in Australia". The revised third edition gives no cause for modification of

this statement. The familiar layout used in the earlier editions has been retained, and the orderly process of describing and analysing in turn the human and physical background to land use, then the major land industries *seriatim*, followed by three chapters on the effects of war and post-war conditions, world economic trends, and the relationship between land use and settlement, succeeds admirably in fulfilling the aims of the authors. Because revision has not involved the complete rewriting of a fundamentally sound text it is somewhat difficult to pinpoint the new features of this edition. These lie, in fact, in the revision and bringing up to date of illustrative statistical material, addenda to sentences, paragraphs and chapters to bring them into line with more recent developments in the rural industries, and the considerable improvement of most of the maps and diagrams. The revision seems almost to have been carried out with a fine-toothed comb. Thus, the 1939-40 wheat yield in Victoria is characterized, at 15·04 bushels to the acre, as *exceptionally high* in the 1950 edition (p. 149), but merely as *high* in the edition of 1957 (p. 137). This, of course, bespeaks not only great attention on the part of the authors but also the fact that what used to be a high wheat yield by Australian standards is now commonplace.

It is carping for a reviewer to comment adversely on a book for not doing the thing it does not set out to do. Although the present volume does not make any claim to adjudicate on general policy matters regarding the balance between primary and manufacturing industries it is clear that the authors bear this vital issue in mind throughout, and they succeed in navigating the shoals of contention that surround it by presenting facts on which others might base their own judgments. But here and there occur what appear to be curious lacunæ. For instance, in the discussion of the beef cattle industry nearly five pages of the text are given to the tropical regions of the continent in the area discussion, less than a page to the southern regions. Admittedly the North is most important as a source of exports, and consequently this emphasis has some validity. But even discounting for the southward movement of cattle into New South Wales, the southern areas are as important beef producers as Queensland and the Northern Territory, and the majority of the cattle moving into New South Wales appear to originate in southern, non-tropical Queensland. Again, although receiving attention in appropriate places, it would seem that the whole problem of pasture deterioration and improvement could now warrant an entire chapter of its own.

But these are really minor criticisms. As it stands the book is an invaluable introduction to the subjects of geography and rural economics alike. It is to be hoped that other experts will in time come forward to deal definitively with the many subjects outlined here in necessarily brief detail. There will always be a need for this type of book on land use in Australia, and the present volume will fill the need for many years to come.

A. J. Rose

Canberra University College.

Atlas of Australian Resources: Five maps with commentaries. (*Education Facilities, Health Services, Dominant Land Use, Ports and Shipping, Population Increase and Decrease 1947-1954.*) (Angus & Robertson, Sydney, on behalf of the Department of National Development, 1958.) 10/6 each Aust.

With the publication of these maps only five remain to complete the set of thirty comprising the Atlas. The maps are printed on 28 x 30 inch sheets.

Education Facilities. The commentary (1956) prepared by the Commonwealth Office of Education gives a short statement on government schools, non-government schools, and tertiary education in its several aspects. Special types of education not distinguished on the map, pre-school education, education by correspondence, education of atypical children, broadcasts for schools, and education of native children, of migrants and adults claim brief attention. The commentary has also seven maps showing educational facilities in the capital cities and Newcastle. Details in the map and the commentary are based on material for Victoria and Tasmania relating to 1953, for Queensland and South Australia for 1954, and for New South Wales and Western Australia for 1955.

Health Services. Like the map for educational facilities, this map shows population density. The commentary (1958) is prepared by the Commonwealth Department of Health. It includes seven maps showing the health services provided in the leading city areas. A section on the occurrence of sickness comments (with tables) on the incidence of disease, changes in the cause of death and improvement in the expectation of life in the past half-century. A clue to the part played by local, state and federal authorities is given in a section on the administration of health services. The types of health services—preventive, curative and constant care—are indicated. The capacity and usage of public and private hospitals in 1956-7 are shown statistically. Necessarily brief, the references to the Aerial Medical Services (with a map), to mental care, to the campaign to reduce the incidence of tuberculosis and to the Home Nursing Service are useful.

"Constant Care" includes a comment on the problem of care of the aged and the creation of geriatric units.

Services provided by voluntary organizations for physically handicapped persons are noted. Health insurance and financial aid in sickness receives attention.

A final section refers to the National Health and Medical Research Council and to medical research and research institutes.

Dominant Land Use. Map and commentary (1957) prepared by the Senior Lecturer in Geography, Canberra University College, are concerned with the location and extent of Australia's main rural industries. The evolution of the present pattern of land use is acknowledged as largely a result of physical and economic considerations. From the nature of its subject perhaps, this map is one of the most effective in this group.

Ports and Shipping. The commentary (1958), prepared under the direction of the Executive Officer (Shipping) of the Department of Shipping and Transport, includes a section on port administration. A series of tables shows Australian overseas and interstate trade from 1914-15 to 1954-5, cargo handled at the principal ports (1954-5), the principal items of trade overseas and interstate, and major works (estimated to cost over £1 million) at ports in Australia in June 1957. Comment on the four main groups of trade—overseas, adjacent islands, interstate and intrastate—is included. Navigational aids and shipbuilding in Australia receive attention. The trends of development in the use of shipping are discussed, and a note on hinterlands is included. An appendix gives further detail in tables and text.

Population Increase and Decrease, 1947-1954. This is the third map dealing with population in the Atlas. The purpose of this map is to show the changes in numbers of rural and urban populations in the intercensal period. The commentary (1958) by W. D. Borrie and Ruth M. Dedman does that and more in dealing with "one of the most remarkable eras of population growth and economic expansion in the history of the Australian Commonwealth". The elements of growth are analysed, as are the changing structure of the population, its occupational and geographical distribution and the urban-rural movements. The text is supported with tables, diagrams and six maps.

M. HARRIS

University of Western Australia.

Early New Zealand. A Dependency of New South Wales 1788-1841. By E. J. TAPP. (Melbourne University Press, 1958.) Pp. vi + 192. 35/- Aust.

In the preface to his book Professor Tapp states that he considers that "although most historians of New Zealand have indicated briefly some of its early relations with New South Wales, they have not . . . revealed their full nature and significance for the European settlement of New Zealand". In this history of early European contacts with New Zealand the author examines these relationships and assesses their significance both for New Zealand and for New South Wales.

The result is a very interesting book indeed. Professor Tapp shows that the possible advantages of different types of economic development in New Zealand influenced very considerably the course of business growth in New South Wales, while the dangers to which such development might expose both Maori and white resident were a matter of much greater concern to most New South Wales governors than has perhaps been realized. The author has clearly shown that, as a result, the ties between New South Wales and New Zealand became steadily closer, and he has sustained his conclusion that "although systematic colonizers in Great Britain were more immediately responsible for the official decision which placed New Zealand's future status beyond question, there is little doubt that apart from such pressure there was sufficient interest in the islands in New South Wales to have made their annexation only a matter of time".

Professor Tapp regards Samuel Marsden in a somewhat uncharitable light. He tends to underestimate the high repute in which he was held by the Maoris and the beneficial influence he exercised among them. It also seems a little harsh to regard Marsden's group of young Maoris, brought to Sydney to learn European economic arts, as "the first hostages to missionary fortunes in New Zealand".

On the other hand the author's appraisal of James Busby's work as British Resident in New Zealand is far more favourable than has been that of some other writers. The difficulties Busby had to face are clearly and fully appreciated, while his positive achievements—intangible as they necessarily often were—are given their meed of praise.

H. R. RODWELL

University of Auckland.

Selected Studies of Migration Since World War II: Proceedings of the Thirty-fourth Annual Conference of the Milbank Memorial Fund, held October 30-31 at the New York Academy of Medicine. (Part III.) (Milbank Memorial Fund, New York, 1958.) Pp. 244. Price not stated.

The conference covered in this book was a sequel to a similar meeting held eleven years earlier, the proceedings of which were published under the title *Postwar Problems of Migration* (Milbank Memorial Fund, New York, 1947). Seen against this background the present volume shows an enormous progress in this very difficult and, as Professor Dudley Kirk in an introductory paper says, "untidy subject". The difficulty and untidiness arise mainly because migration studies have been a legitimate field of research of a number of social sciences and because, as yet, no satisfactory inter-disciplinary approach has been developed. The present volume is an attempt at such an approach but the individual contributions—ranging from a discussion of immigration policy and of internal migration in Japan to an examination of nativity differentials in mental disease in New York State—are not at all integrated. Perhaps the most intelligently stimulating is the paper by Professor J. J. Spengler in which he discusses some of the economic effects of migration and suggests a number of aspects which would repay a further empirical study. His suggestions should merit serious consideration by many an Australian postgraduate student who might be contemplating a suitable subject for a Ph.D. thesis. This is certainly a field of study to which Australian economists could well turn their attention.

J. ZUBRZYCKI

Australian National University.

Population Growth and Economic Development in Low Income Countries: A Case Study of India's Prospects. By A. J. COALE and E. M. HOOVER. (Princeton University Press, 1958.) Pp. xxi + 389. $8.50.

This is an important work which should be studied carefully by all who wish to understand the problems with which the Indian Five-

Year Plans have to cope. The importance of the book lies less in the sections dealing with economic growth, for here the ideas are substantially those already expounded by W. A. Lewis, than in the painstaking way it analyses recent and current growth and structure of India's population, and the changes in structure that can be expected to occur in the future given certain assumptions concerning trends in fertility and mortality. In these regards this book must be taken as *the* authority for those concerned with India's economic and social welfare.

Assuming an increase in expectation of life from 32 years in 1951 to 52 years in 1986, and fertility continuing at present levels, India's population would increase over this period from 357,000,000 to 775,000,000. With fertility unchanged until 1966 and thereafter declining linearly to about the present Australian rate, or half the present Indian rate, the population would still reach 634,000,000 by 1986.

Staggering as these figures are, the authors feel that India's resources can cope with the position for the next thirty years or so, with even rising living standards; but unless fertility can be checked the structure of the Indian population before the end of the century will be such that a second tremendous upsurge will quickly revive the Malthusian bogy. It is this second wave of growth inherent in current population structure and fertility patterns that emphasizes the urgency, not only of economic planning, but also of *some* form of control over fertility.

Coale and Hoover concentrate their attention upon India, with only brief intrusions of comparative data; but their analysis has considerable application to at least half of the world's population.

W. D. Borrie

Australian National University.

The Strategy of Economic Development. By Albert O. Hirschman. (Yale University Press, New Haven, 1958.) Pp. 217. $4.50.

The title of this book tends to arouse too great expectations. In fact it does not deal with the grand problems of economic development, but rather with certain aspects of investment policy as encountered by economic advisers in under-developed countries. As such the book must be of great value to persons on the staffs of international institutions like the I.B.R.D. or the various American technical and financial aid schemes. The main thesis of the book is the sensible one that—under conditions of political and social non-interference with the sociological foundations of under-development—a policy of balanced growth as advocated by writers like Nurkse is impossible. Hirschman develops a theory which compares a growing investment sector to a jigsaw puzzle where the consolidation of one industry renders possible and necessary the establishment of other industries and institutions in due course. To balanced development he, therefore, opposes development as a chain of disequilibria. In the course of outlining this theory Hirschman does a good job of debunking a number of firmly held ideas—one of the most important being that aid to under-developed countries should

always be for specific projects. A margin for manoeuvre for a country's "unbalanced" growth seems of equal importance with the finance of specific approved projects.

The drawbacks of the book are the absence of a clear theory of capital and that it is studiously non-sociological. The word "poverty" is not mentioned once, and the question of class relations between peasants and landholders, between middle-class and agrarian interests, between workers and employers, between foreign vested interests and local industries is left out of the scheme of discussion. Yet it is undoubtedly in such terms that the problem of development presents itself to the peoples who are striving for better livelihood. However, within its limitations this is a book which will prove very useful to bankers and young administrators who have to take the existing state of affairs in under-developed countries for granted.

W. ROSENBERG

University of Canterbury.

International Trade and Economic Growth. By HARRY G. JOHNSON. (Allen & Unwin, London, 1958.) Pp. 204. 25/- stg.

Professor Harry Johnson has here collected articles which have appeared in various journals from 1953 to 1958. These include some of the most fruitful contributions to international trade theory of recent years, though in some cases the value of the article must be limited by the difficulty involved in understanding it. The arguments are closely knit and the presentation highly condensed; Professor Johnson describes his method as "the application of mathematically-based logical analysis to theoretical problems".

The core of the book is Part II which consists of Professor Johnson's three well-known articles on the relationship between international trade and economic growth. On the level of abstraction at which these articles are written, they must be regarded as the standard works on the subject so far.

The clearest and most elegant of the three articles is "Increasing Productivity, Income-Price Trends and the Trade Balance", reprinted from the *Economic Journal*, 1954. Imagine a two-country world, say the dollar and the non-dollar world or even Australia and The Rest. Say that one country is growing more rapidly than the other and that within each country growth is evenly distributed between industries (or that each country is producing only a single product). How will the balance of trade between the two countries be affected? This is one form in which the long-run dollar problem has been posed. The general answer is as follows: *If* the relationship between the price-levels of the two countries does not alter, and *unless* its income elasticity of demand for imports is sufficiently below that of the slower-growing country, the balance of trade of the more rapidly growing country will deteriorate. But in addition, if growth is due to productivity improvements, the price-level of the country which is growing more rapidly is likely to fall relative to the price-level of the other

country. This *price-effect* will tend to improve its balance of trade provided the sum of the elasticities of demand for imports of the two countries is greater than unity, and to worsen it if the sum is less than unity. Combining income and price-effects, the total effect on the balance of trade then depends on (i) the relative growth rates, (ii) the relative income elasticities of demand for imports, (iii) the change in the relative price-levels associated with growth, and (iv) *if* relative prices change, the value of the sum of the elasticities of demand for imports. In this notable article Professor Johnson has elucidated these relationships; its contribution goes beyond the long-run dollar problem discussion which originally inspired it.

In "Economic Expansion and International Trade", from the *Manchester School*, 1955, Professor Johnson deals with the effects of growth on the terms of trade assuming full employment and balance of payments equilibrium. This article explores in some detail the fruitful concept of *biases* in growth (pro-trade bias, anti-trade bias). It shows the way to a method of thinking which (for example) could help to clarify discussion in Australia on the "import replacement" issue. Although here Professor Johnson assumes that the balance of payments is automatically brought into equilibrium by some sort of equilibrating device, and focuses attention on the resulting effect on the terms of trade, the techniques could be adapted to study the effects on the balance of payments and so indicate the direction in which equilibrating measures have to operate. Professor Johnson has added in the book some mathematical footnotes which help a little in following an exceedingly compressed argument. He has also added a section which uses the same techniques to analyse the effects on the terms of trade of movements of labour, capital and technology between countries.

The third of the articles on trade and growth, "Equilibrium Growth in an International Economy", from the *Canadian Journal of Economics and Political Science* 1953, extends the Harrod-Domar model of equilibrium growth at full employment. The interest of this article is limited, for, as Professor Johnson himself points out in the introduction to the book, "The crux of the Harrod-Domar analysis, the knife-edge requirements of self-justifying growth has, however, ceased to interest economic theorists, in consequence of the recognition that the savings ratio and the capital-output ratio are not parameters but variables amenable to economic policy or subject to equilibrating forces." Broadly two types of models are considered. First, suppose that balance of payments disequilibrium is not allowed to persist; then the international trade effects of growth consist of effects on the terms of trade. To maintain full employment, each country will grow at its equilibrium growth rate, this being the product of the savings ratio and the output-capital ratio. The main complication introduced by international trade is that changes in the terms of trade affect the distribution of real income between the countries, hence the savings ratio and thus the two growth rates. Alternatively, suppose that balance of payments disequilibrium is allowed to persist, the imbalance helping

to determine the growth rates in the two countries through its effect on employment. One form in which the problem can then be posed is as follows: *if* growth in one country is given, this carrying with it a certain growth in its demand for imports, what is the growth rate required in the other country to maintain full employment?

Another interesting chapter, "Towards a General Theory of the Balance of Payments", is published in English for the first time. It is an attempt to synthesize and extend the "absorption approach" to balance of payments policy. Professor Johnson makes two distinctions which can be useful for discussion of these matters. He distinguishes between "stock" and "flow" balance of payments deficits, the former being temporary by their very nature but very important in practice (though rather neglected in the international trade literature). And he classifies the various alternative policies for dealing with balance of payments difficulties as either "expenditure-reducing" or "expenditure-switching", bearing in mind that some policies are both "reducing" and "switching". An Australian reader cannot help thinking that the understanding of this last distinction is greatly aided by Professor Swan's well-known (but unpublished) diagram showing the interrelated effects of "reducing" and "switching" policies.

Finally, Professor Johnson has included in the book "Optimum Tariffs and Retaliation", from the *Review of Economic Studies* 1953-4, "The Transfer Problem and Exchange Stability" (*Journal of Political Economy* 1956) and "Factor Endowments, International Trade and Factor Prices" (*Manchester School* 1957). In the optimum tariffs article his aim is to prove "that a country *may* gain by imposing a tariff even if other countries retaliate; and to determine the conditions under which it *will* gain in a special group of cases". This is in contradiction to various other writers who have stated or assumed that once retaliation to trade restriction occurs, all parties are bound to lose as compared with the free trade situation. This article is the standard theoretical work on tariff retaliation. It is highly taxonomic, the argument is pursued to its very difficult limit, and the average reader may be content to believe the conclusion but hesitate to work through the exposition of all the implications of a somewhat unrealistic model. The chapter has a valuable Appendix on "Alternative Optimum Tariff Formulae" (from the *Review of Economic Studies* 1950-1) which relates the various formulae that have been used to express the optimum tariff. It is an essential reference to students of the history of optimum tariff theory.

W. M. CORDEN

University of Melbourne.

The Economic Theory of Fiscal Policy. By BENT HANSEN. (Allen & Unwin, London, 1958.) Pp. xv + 450. 45/- stg.

This volume is the product of a logical mind, and eschews completely the comforting but slipshod discussions that often prevail in this subject. The result is a highly competent and stimulating volume

which is tough and technical throughout. It provides an object lesson in the difficulty of deriving simple generalizations about the effects of fiscal policy.

Part I—"General Theory of Fiscal Policy"—is almost entirely methodological in purpose and only provides simple theoretical models as illustrations of Hansen's methodological precepts. He insists on a clear distinction between the means and ends of fiscal policy, leading him to distinguish the State's "parameters of action" from the endogenous variables of the system. The implication of this distinction is ". . . that constant relationships can generally only be expected between parameter changes and changes in endogenous variables, not between the changes in the endogenous variables themselves". (P. 65.) Simple connections between changes in the budget balance, for example, and changes in other endogenous variables cannot be deduced, for the budget balance is itself an endogenous variable and not an action parameter of the State. In order to determine the effects of fiscal policy on the economy, one must discuss the effects of changes in the rates of taxation and the State's real expenditure plans, etc., with the knowledge that the effect on both the budget balance and on the economy will depend on the particular action parameters that are selected.

This formal methodological discussion of the meaning of concepts and hypotheses is a useful antidote to many "slogans" about fiscal policy, but it cannot be interpreted as a "Theory of Fiscal Policy" as Hansen's title to Part I suggests. It only provides a methodological framework, in terms of which a theory can be stated—and indeed, the main theoretical sections of this book are to be found in Parts II and III.

The aim of Part II ". . . is to derive hypotheses about the place of State action parameters in household demand functions (and) in the price and output decisions of firms" (p. xii). These hypotheses are derived by extending Irving Fisher's "intertemporal preference" theory of saving to a theory of income disposal, where income and consumption tax rates are explicitly introduced into the analysis. In these terms Hansen attempts to produce a simple marriage of Fisher's approach and Swedish period analysis. One may well doubt the empirical usefulness of Hansen's theoretical results, but ". . . there is hardly any empirical investigation which sets out directly to illustrate the importance of fiscal policy for household planning" (p. 185). Hansen feels that Duesenberry's experiments in this field are not fully convincing. In this connection it is a pity that the original Swedish version (1955) was published too early for Hansen to consider the applicability of Friedman's ideas to his problem. The argument is extended to firm-behaviour as an "intertemporal theory of production", but the analysis seems unwieldy. If "empirical relevance" is the aim, the search for aggregative hypotheses which are justified on purely pragmatic grounds may well give more fruitful results.

In Part III Hansen constructs a general model in terms of which "the total effects" of fiscal policy can be discussed. The model is highly

abstract and provides a tentative indication only of the role of certain major relationships. It is used to illustrate how various changes in fiscal policy (with any aim in view) may require other compensating measures, in order to secure the *primary* aims of a stable price level and full employment of labour. The meaning of these latter aims, and their possible conflict, are discussed at length.

In this latter half of the book Hansen deals with much else besides his general model. Long dissertations on "Direct versus Indirect Taxation", "Long-term Problems", "Wage Policy", "External Trade and Fiscal Policy", and the "Problem of Uncertainty" are presented. Each of these sections represents an important contribution.

It is impossible not to be impressed by the extent of Hansen's theoretical contribution, even if one is inclined to doubt its empirical usefulness at many points. Any student of this subject who is interested in the intermingling of theory and practice cannot afford to ignore the point of view so carefully and thoroughly stated in this volume.

H. R. HUDSON

University of New South Wales.

Policy Against Inflation. By R. F. HARROD. (Macmillan, London, 1958.) Pp. xii + 257. 39/9 Aust.

This is an important, interesting book, but of a type altogether different from that of *Towards a Dynamic Economics.* Addressed to the interested layman, the book is lucidly written yet some of the argument seems pitched at a level more appropriate to the professional economist.

Its object is to set out, at least partly so that the city may understand in the future what it has not understood in the past, the correct objective and criteria of economic policy, which for the most part seems to coincide with monetary policy. "The most important principle is that monetary policy, along with other measures of economic policy, should be regulated so as to equate the total demand for goods and services to the supply potential of the economy, making allowance for growth potential." In securing this objective, emphasis should be placed on changes in the quantity of money, not so much for the interest rate effects as for the influence on the ease or otherwise of borrowing. This is held even though the drift of investors out of gilt-edged into equities and the financing of the nationalized industries present serious obstacles to the efficient management of the money supply.

Beginning with chapters on the gold standard and the managed currency which has replaced it, the author passes on through an exposition of Keynes's ideas to the core of the book, with chapters on sterling balances, devaluation, growth, the restrictive measures of 1955, and wages. The book concludes with a chapter on "The Fundamental Principles of Policy".

Harrod is convincing in his argument that the failure to fund the

foreign-held sterling balances is the most important mistake of the British policy-makers since the war. Its legacy has been a "tightrope" situation bedevilled by expediency and a lack of firmly-based principles of policy.

Lack of clear policy, misunderstanding and undue pessimism must carry a large share of the blame for Britain's post-war economic difficulties, but these may be rectified, and, this done, her economic prospects should be bright.

Not everyone will be satisfied with the status given to the monetary policy or with the reliance placed on persuasion as a remedy for "wage-push" inflation, but everyone will be satisfied that here is a book which needed to be written and that probably only Harrod could have done it so well. It is a pity perhaps that it was "confined to what will secure general consent, at least among the younger generation of economists".

A. R. G. Prowse

University of Melbourne.

Business Enterprise: Its Growth and Organisation. By Ronald S. Edwards and Harry Townsend. (Macmillan, London, 1958.) 60/- stg.

An evening seminar "Industrial Administration" had been held at regular intervals in the London School of Economics for "some ten years", and eight pages of this book are needed to record acknowledgments to the business men, civil servants and other contributors to the seminars. The first two parts of the book draw heavily for descriptive material upon the industrialists' contributions. Thus, the reader is treated to an up-to-date version of Samuel Smiles on "Self-help"; he may learn a little about the origins of the Simon Engineering Group, Solway Chemicals, Marconi, the Bristol Aeroplane Company or Aero Research Limited. These thumb-nail sketches are lucid and well chosen. For this reason, the work will be invaluable to applied economists seeking illustrations to theories of entrepreneurship.

The authors admit that their "idiosyncratic choice of subjects" strung together in Parts 3 and 4 is in some way linked to the prejudices they have "accumulated" along with experience; the warning is hardly necessary.

The second half of the book is indeed intended as a polemic against government interference in industry, whether in research activities, encouragement to or compulsion of industries to set up "common services" organizations, control of investment plans, or any other form. The book is thus a true child of the early 1950's, the quinquennium of reaction against the reformist zeal of Sir Stafford Cripps. The polemic is itself interesting, but would have been much more convincing if the authors had not covered so much ground, and had been prepared seriously to consider some of the counter-arguments; moreover, since it is admittedly one-sided it is quite inadequate as a text-book on the subjects under discussion.

The most unsatisfactory feature of the whole book is that the authors do not attempt to proceed from a survey of *all* the relevant facts on any issue whatsoever to a conclusion of any substance. They dismiss contemptuously, for instance, the "well-meaning people" who are concerned about the costs of the high casualty rate in new businesses in the twentieth century, with arguments like: "could it have been foreseen" that Josiah Wedgwood's enterprise started in 1759 would later in his lifetime employ 400 people? This is the height of the *non sequitur*; a social scientist, writing in that capacity, would try to assess costs and to assess benefits. The authors are so convinced *a priori* of the merits of private enterprise that they make no attempt at a tally. They quote approvingly Lord Heyworth's pregnant remark that all business decisions are taken in a fog, and much later in the book they underline that serious mistakes in private enterprise decisions are an unavoidable ingredient in the system. Yet if a government department gets into a position where some mistakes are possible, they are inclined to chortle that this proves that interference is never worth while.

This book then, even if in its worst passages it might have been written by Lucky Jim, is full of interest, true to the epoch of its production, stimulating, shallow, and completely readable. The data from the seminars are original; some of the polemical points are well made, and the chapters on economies of scale and large-scale enterprise make a useful contribution to knowledge.

I. BOWEN

University of Western Australia.

ECONOMIA INTERNAZIONALE

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Growth, Terms of Trade and Comparative Advantages .. .. J. N. Bhagwati

Su alcuni aspetti della formazione dei prezzi nelle economie pianificate .. .. .. V. Vitello

The Production Elasticity of U.S. Raw Material Imports .. .. E. von Boventer

Sui recenti contributi di E. H. Chamberlin .. .. A. Predetti
Concentration of Agriculture in the United States .. .. A. Bilimovich

Bollettino Bibliografico ed Emerografico: Books Review—Titles of articles in recent periodicals —Summary of articles issued on recent periodicals.

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BOOKS RECEIVED*

A.—AUSTRALIAN AND NEW ZEALAND PUBLICATIONS

DOWNING, R. I. *National Superannuation: Means Test or Contributions?* (The 28th Joseph Fisher Lecture in Commerce.) (University of Adelaide, 1958.) Pp. 23. Free on application to Registrar, University of Adelaide.

In this lecture, Professor Downing makes a further contribution to the national discussion of improvement in the provision for old age. After reviewing other schemes for pensions, such as the British Labour Party's proposals and the Netherlands scheme, he concludes that the Australian system of pensions subject to a means test has substantial advantages, though improvements should be introduced to meet special needs and to remove anomalies in the means test. Professor Downing also discusses measures to protect private savers against inflation.

ECONOMIC SOCIETY OF AUSTRALIA AND NEW ZEALAND (NEW SOUTH WALES BRANCH). *Minerals in the Development of Australia.* (*Economic Papers* No. 12.) (Sydney, 1958.) Pp. 94. Price not stated.

HILL, M. R. *Housing Finance in Australia, 1945-1956.* (Melbourne University Press, 1959.) Pp. 212. 45/- Aust.

NATIONAL DEVELOPMENT, DEPARTMENT OF. *Atlas of Australian Resources:* Five maps. (*Dominant Land Use, Educational Facilities, Health Services, Ports and Shipping,* and *Population.*) (Angus & Robertson, Sydney, 1958.) Each map 10/6 Aust.

SHERRARD, H. M. *Australian Road Practice.* (Melbourne University Press, 1958.) Pp. 407. 105/- Aust.

The author makes it quite clear that this is a book for engineers interested in road construction and maintenance. The final chapter is the only reference made to financial problems, but even this is short and makes no attempt at detailed study. Other chapters deal with the various aspects of road and pavement construction, organization and methods of maintenance, road design principles and practice, and other topics of interest to road and highway engineers. It is particularly well illustrated, and all diagrams are carefully explained.

SPANN, R. N. (ed.). *Public Administration in Australia.* (Government Printer, Sydney, 1959.) Pp. 502. 47/6 Aust.

The Australian Journal of Statistics. Vol. 1, No. 1, April 1959. (The Statistical Society of New South Wales, Sydney.) Pp. 34. 10/- Aust. (There will be three issues per year. The Journal is free to members of the Society.)

This is a most necessary and welcome addition to the learned journals of Australia. The three papers in the first number cover an admirably wide range of topics: "Estimation of Resource Productivities as Illustrated by a Survey of the Lower Murray Valley Dairying Area", by F. G. Jarrett; "A Problem in Economic Allocation of Effort in Fault Detection", by M. A. Hanson; and "Generation Life Tables for Australia", by H. O. Lancaster.

WESTSTRATE, C. *Portrait of a Modern Mixed Economy: New Zealand.* (New Zealand University Press, Wellington, 1959.) Pp. 310. 22/6 N.Z.

B.—OTHER PUBLICATIONS

BANSIL, P. C. *India's Food Resources and Population.* (Vora, Bombay, 1958.) Pp. 252. Rs. 10.00.

The author's cursory examination of India's population trends concluded that between 1951 and 1981, 150,000,000 persons would be added to the population, making a total of 500,000,000. Nevertheless, he felt that India would be able to feed her teeming millions, and used actual and *projected* grain production data to support his contention.

The "dream of a better and happier India" (p. 240) is dependent upon the realization of this projected grain production along with concurrent plans for industrial development. The failure to realize them will give rise to even more acute problems than there are now, and the future will be unlikely to "take care of itself" (p. 242).

BRAND, W. *The Struggle for a Higher Standard of Living.* (The Free Press, Glencoe, Illinois. W. van Hoeve, The Hague, 1958.) Pp. 447. $7.50.

This is a translation of a book originally published in Dutch in 1954. At that time it must have represented an important contribution. Since that date,

* Acknowledgment of publications does not guarantee review.

however, there have been many comparable books published in English on the development of backward countries. This book by Brand cannot therefore make the impact and contribution it would have made had it been published in English in 1954, though it remains a good text within its field.

CHAND, GYAN. *The New Economy of China.* (Vora, Bombay, 1958.) Pp. 443. Rs. 16/-.

In a book making strange reading to Western eyes, answers are given to certain questions about the new regime. How has productivity changed? How was the land reform achieved? How are industry and commerce organized? What can be done to cope with the increase in population? The analytical work on motivation and incentives will provoke further questions from the reader.

CLAIRMONTE, FRÉDÉRIC. *Le Libéralisme Economique et les Pays Sous-Développés.* (E. Droz, Geneva, 1958.) Pp. 361. Fr. s. 30.

M. Frédéric Clairmonte includes in the term "economic liberalism", most classical, neo-classical and Keynesian economic doctrines. He argues that economically "advanced" countries have developed on semi-oligopolistic lines, with an unforeseen combination of monopolistic tendencies and massive state interventionism, while under-developed economies have structural problems demanding interventionist measures, so that in both cases "economic liberal" ideas are wholly inapplicable (for example, the injunction to attain optimum welfare mainly through a price mechanism).

M. Clairmonte discusses economic development in the light of his main thesis, and reviews the main theoretical contributions of most leading authorities now writing on development.

COALE, ANELEY J., and HOOVER, EDGAR M. *Population Growth and Economic Development in Low-Income Countries.* (Princeton University Press, 1958.) Pp. 410. $8.50.

CONDLIFFE, J. B. *The Welfare State in New Zealand.* (Allen & Unwin, London, 1959.) Pp. 396. 35/- stg.

COOK, P. LESLEY, and COHEN, RUTH. *Effects of Mergers.* (Allen & Unwin, London, 1958.) Pp. 458. 42/-.

This book brings together six case studies of mergers in British industries. The industries are cement, calico printing, soap, flat glass, motor vehicles and brewing. The diversity of factors operating prevents any clear generalized conclusions but illustrates the value of such studies in revealing the actual working of the economy and points to the need for similar Australian studies.

DACCA UNIVERSITY SOCIO-ECONOMIC SURVEY BOARD. *Report on the Survey of Rural Credit and Rural Employment in East Pakistan, 1956.* (Dacca, East Pakistan, 1958.) Pp. 338. Rs. 7-8-0 Pakistani.

This report presents detailed information on the sources and uses of rural credit, the rates and types of interest payable, the security required and the relationship between security, source of credit and interest charged. It is based on a survey on over 3,000 households in four distinct areas of East Pakistan.

Unemployment is briefly discussed in relation to the pattern of land utilization and of subsidiary occupations.

EDWARDS, R. S., and TOWNSEND, H. *Business Enterprise—Its Growth and Organization.* (Macmillan, London, 1958.) Pp. 624. 60/- stg.

FORD, P. *The Economics of Collective Bargaining.* (Basil Blackwell, Oxford, 1958.) Pp. 135. 10/6 stg.

This study attempts to outline the main ways in which union activity in Great Britain has affected wages through use of collective bargaining and voluntary arbitration processes. The approach is inductive and much case history is cited. However, accompanying discussion is fragmentary and insufficient emphasis and perspective are given to the inferences which are drawn.

GERSDORFF, RALPH VON. *Massnahmen zur Forderung der Privaten Kapitalbildung im Portugiesischen Reich.* (Polygraphischer Verlag, Zurich, 1958.) Pp. 265. Fr. s. 12.45.

The author discusses the problems of economic growth and various political measures which are or could be used to promote it in Portugal. Owing to the peculiar political and social set-up of this country, however, it is doubtful whether these measures could be applied in other economically less-developed countries.

HABERLER, G. *Prosperity and Depression.* 4th ed. (Allen & Unwin, London, 1958.) Pp. 517. 28/- stg.

In this new version of Haberler's familiar work, Parts I and II remain unchanged from the previous edition. These sections discuss the important trade

cycle theories up to the time of Keynes. The Keynesian analysis of Part III of the earlier edition has been replaced by a new chapter entitled: Monetary and Real Factors Affecting Economic Stability. There are also two appendices new to this edition: one on the state of contemporary business cycle theory and the other on the Pigou Effect.

HANSEN, BENT. *The Economic Theory of Fiscal Policy.* (Allen & Unwin, London, 1958.) Pp. 465. 45/- stg.

HARE, A. E. C. *The First Principles of Industrial Relations.* (Macmillan, London, 1958.) Pp. 145. 20/9 Aust.

Providing useful preliminary reading for intending students of industrial relations, the book involves an analysis of causes of, and suggestions for overcoming, industrial discontent. Because of well-pointed distinctions and orderly classification in the discussion of the causes of discontent, the book is of value also for the more expert in a field crammed with unoriented "factual" studies.

HARROD, R. F. *Policy Against Inflation.* (Macmillan, London, 1958.) Pp. 269. 39/9 Aust.

HERLEMANN, H. H., and STAMER, H. *Produktionsgestaltung und Betriebsgrösse in der Landwirtschaft unter dem Einfluss der wirtschaftlich-technischen Entwicklung.* (*Kieler Studien* 44.) (Institut für Weltwirtschaft an der Universität Kiel, 1958.) Pp. 153. DM 14.

This study analyses the influence of economic and technical development on the income, costs, and size of farms. The first part is a theoretical discussion, the second a statistical presentation based on 1955 data of 32 countries, with emphasis on Western Germany.

HIRSCHMAN, ALBERT O. *The Strategy of Economic Development.* (Yale University Press, New Haven, 1958.) Pp. 230. $4.50.

JOHNSON, HARRY G. *International Trade and Economic Growth.* (Allen & Unwin, London, 1958.) Pp. 204. 25/- stg.

JUCKER-FLEETWOOD, ERIN E. *Economic Theory and Policy in Finland 1914-1925.* (Basil Blackwell, Oxford, 1958.) Pp. 127. 15/- stg.

This is a publication of the Basle Centre for Economic and Financial Research. The centre was initiated by the Rockefeller Foundation in 1952. The publication contains two essays: "Why did Finland escape the 1921 crisis?" and "Devaluation and the return to the gold standard at a new parity 1922-1925". In the words of the author: "the theories used are, for the war and the immediate post-war years, that of the quantity theory of money, and for the stabilization period 1922-1925, that of a theory of purchasing power parities discriminately applied".

KELF-COHEN, R. *Nationalisation in Britain. The End of a Dogma.* (Macmillan, London, 1958.) Pp. 310. 25/- stg.

In this book the author examines critically the performance of the British coal, transport, electricity, gas and iron and steel industries, under nationalization. Later chapters are devoted to a comparative analysis of such problems common to the public corporation as accountability to parliament, finance, quality of board and staff members, labour relations and the consumer councils. These problems rather than the nature of the industries themselves are held to account for the shortcomings distinguished.

LAFITTE, PAUL. *Social Structure and Personality in the Factory.* (Routledge & Kegan Paul, London, 1958.) Pp. 228. 24/- stg.

LEVIN, HARVEY J. (ed.). *Business Organization and Public Policy.* (Rinehart, New York, 1958.)

The increasing size of academic institutions places a strain on library facilities and creates a demand for books of readings such as this one. Within the general theme of government policy towards business, this anthology covers such topics as workable competition, industrial concentration, the anti-trust laws, countervailing power, price discrimination, agricultural policy, conservation of natural resources and public utility regulation.

MACHLUP, F. *An Economic Review of the Patent System.* (United States Senate: Subcommittee on Patents, Trademarks, and Copyrights, Committee on the Judiciary.) (U.S. Government Printing Office, Washington, 1958.) Pp. 89. Price not stated.

In this important study prepared for the U.S. Senate Subcommittee on Patents, Trademarks and Copyrights, Professor Machlup offers a penetrating analysis of the patent system and its effects. Recognizing that on the basis of existing knowledge no economist can say with certainty whether or not the patent system confers a net benefit on society, the author concludes that it is irresponsible to recommend abolishing a well-established patent system (or to

recommend instituting one where none exists). However, his main contribution in this study is his demonstration of the way marginal analysis can be applied in assessing the effects of *changes* in the patent system, for example, changes in the duration of patents, the introduction or abolition of compulsory licensing, etc. All of the major arguments for and against patent protection and the economic issues involved are discussed. The contribution is a significant one.

MANSERGH, NICHOLAS, and Others. *Commonwealth Perspectives.* (Duke University Press, North Carolina. Cambridge University Press, London. 1958.) Pp. 214. 34/- stg.

This is a symposium of seven essays on various aspects of the Commonwealth. Of most interest to Australasian economists will be Ratchford's survey of "The Development of Health and Welfare Programs in Australia" since 1900. There are also essays by Spengler on the demography of the Commonwealth and by Brinley Thomas on the evolution and prospects of the sterling area.

MARTIN, ANNE. *Economics and Agriculture.* (Routledge & Kegan Paul, London, 1958.) Pp. 177. 21/- stg.

This excellent little book contains nine chapters. The first six are concerned with theoretical economic concepts such as the scope of economics, demand, supply, forms of competition and economic efficiency. The last three chapters deal with the reasons for an agricultural policy, the policy measures used, and land tenure.

METZGER, ROBERT W. *Elementary Mathematical Programming.* (John Wiley & Sons, New York, 1958.) Pp. 246. $5.95.

The work describes, with detailed examples, devices for solving programming problems of the transportation type. Progression through such techniques leads to a pragmatic description of the Simplex method with virtually no mathematics. A useful manual for industrial planning clerks with no mathematical training, its narrow coverage and lack of general analysis disqualifies it as a text-book for programming theory.

MIKESELL, R. F., and BEHRMAN, J. N. *Financing Free World Trade with the Sino-Soviet Bloc* (Princeton Studies in International Finance No. 8). (International Finance Section, Department of Economics and Sociology, Princeton University, 1958.) Pp. 250. U.S.A. $0.25; elsewhere free of charge.

The basic object of the study is the financial and trading practices of the Free World and Communist Bloc countries. Most of the trade is conducted under some form of bilateral agreement. The investigation has centred on the character and operation of these agreements and on the economic and political motivations underlying them. The principal aim has been to evaluate trading and financial practices and arrangements from the standpoint of the interests and objectives of the Free World.

MILBANK MEMORIAL FUND. *Selected Studies of Migration since World War II.* (Milbank Memorial Fund, New York, 1958.) Pp. 244. Price not stated.

NERLOVE, M. *The Dynamics of Supply: Estimation of Farmers' Response to Price.* (The Johns Hopkins University Studies in Historical and Political Science, Series LXXVI, No. 2.) (Johns Hopkins Press, Baltimore, 1958.) Pp. 267. Cloth $5, paper $4.

The relation of U.S. farmers' expectation of price levels for maize, cotton and wheat, which are not directly observable, to the acreages they planted with these crops is shown to be much more elastic than that of actual prices to acreages. The main empirical and methodological results of this 1956 dissertation, together with further work, have appeared in the *Journal of Farm Economics* and elsewhere.

NICULESCU, BARBU. *Colonial Planning.* (Allen & Unwin, London, 1958.) Pp. 204. 18/- stg.

This work studies on a comparative basis the background and the administrative machineries for the drafting and executing of plans for colonial economic development, both in the metropolitan countries and in their colonies. Its emphasis throughout is on the administrative rather than the economic aspects. This approach makes the book a very useful addition to the more narrowly economic literature on the subject, but on the other hand of rather limited interest to the non-specialist in colonial planning.

PHELPS, C. W. *The Role of Factoring in Modern Business Finance.* (Educational Division, Commercial Credit Company, Baltimore, 1956.) Pp. 70. Available free for classroom use and similar educational purposes.

This monograph is No. 1 in the series of Studies in Commercial Financing sponsored by one of the "Big Three" American sales finance companies. The

study gives details of the meaning, methods of operation, advantages and costs of the factoring of Accounts Receivable in the U.S. It is a useful outline of a method of business finance which is not currently used in Australia, but which may well develop here within the next decade or so.

QUANTE, PETER. *Die Abwanderung aus Landwirtschaft.* (Institut für Weltwirtschaft an der Universität Kiel, Kiel, 1958.) Pp. 221. DM. 18.

This is a complete and very thorough study of the "drift to cities".

Two aspects of the problem are pointed out, viz.: drift of population from rural to urban centres and from agriculture to other occupations. The reasons for both are discussed and the author concludes that the "drift to cities", in its second aspect, is a necessary condition of economic progress. This conclusion is supported by examples from various countries.

RYAN, W. J. L. *Price Theory.* (Macmillan, London, 1958.) Pp. 396. 49/9 Aust.

This is a lucid and well-written book on micro-economic theory that provides a fresh approach to traditional analysis and concludes with a brief consideration of mathematical programming and game theory. Relying heavily on diagrams the author presents a combination of rigour and simplicity that should appeal to serious first-year students.

SCHRIER, ARNOLD. *Ireland and the American Emigration 1850-1900.* (University of Minnesota Press, Minneapolis, 1958.) Pp. 210. $4.50.

This is a study of the impact of Irish emigration to America on Ireland itself. It discusses the reaction of different Irish groups to America and to emigration, the effects of emigration on the Irish standards of living (in terms of land ownership, land use, rural wages, employment, housing standards and the growth of industry), and the effect of emigration and emigrants on Irish social life. Interesting use is made of emigrants' letters and folk-lore history.

SCITOVSKY, TIBOR. *Economic Theory and Western European Integration.* (Allen & Unwin, 1958.) Pp. 153. 16/- stg.

Meade's "Problems of Economic Union" was addressed to a lay public and is lucid, simplified and abstract. Scitovsky's essays are for economists only. His treatment is more complex and partly quantitative. The approach is different because of the author's conviction that there is little scope for beneficial reallocation of production between member countries and that their gains will have to come from the effect on efficiency of increased competition.

SHENOY, B. R. *Problems of Indian Economic Development.* (University of Madras, 1958.) Pp. 246. Rs. 10/-.

Professor Shenoy's six lectures on current problems provide an acute, lucid and highly critical commentary on economic planning as now practised in India. His approach is fortunately empirical and not doctrinaire, and no one who wishes to appreciate India's difficulties in attaining planned goals of development should miss reading this important commentary, a learned analysis spiced with percipient common sense.

STISSER, REINHOLD. *Problems of India's Economic Development.* (Institut für Weltwirtschaft an der Universität Kiel, Kiel, 1958.) Pp. 83. DM. 8.

This short study describes the problems facing India's planners and their achievements under the First Five-Year Plan. It ends with a strong plea for greater foreign aid. Along with other publications referred to in the text, it reflects the serious interest which German scholars are now showing in India's economy.

THOMASSEN, HENRY. *Business Planning for Economic Stability.* (Public Affairs Press, Washington, 1958.) Pp. 60. $2.50.

This book outlines a scheme for business planning whereby, so the author believes, firms would be able to achieve economic stability and render Government counter-cyclical policies not only unnecessary but positively harmful. The subject certainly merits serious attention, but unfortunately Dr. Thomassen's superficial treatment and unrealistic analysis of business psychology and behaviour leaves the reader wholly unconvinced.

WHELPTON, P. K., and KISER, CLYDE V. (ed.). *Social and Psychological Factors Affecting Fertility.* Vol. V. (Milbank Memorial Fund, New York, 1958.) Pp. 286. $1.

This is the final volume of reports on a study, made in Indianapolis in 1941, which attempted to test 23 hypotheses concerning fertility on a sample of 1,444 couples who had married during 1927-9. In the concluding paper the editors have reviewed, comprehensively and objectively, the findings and defects of the study and the methods used.

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